WORLDWIDE PDB PROTEIN DATA BANK

wwPDB X-ray Structure Validation Summary Report ⓘ

Jan 14, 2024 – 01:53 am GMT

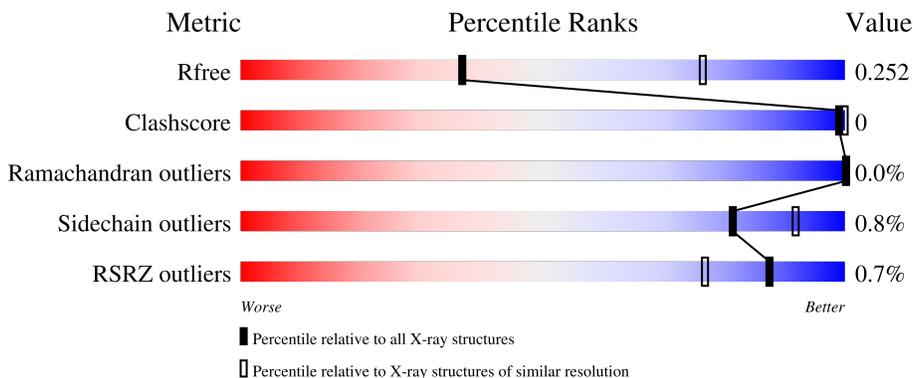|		
PDB ID	:	6RP9
Title	:	Crystal structure of the T-cell receptor NYE_S3 bound to HLA A2*01-SLLMWITQV
Authors	:	Coles, C.H.; Mulvaney, R.; Malla, S.; Lloyd, A.; Smith, K.; Chester, F.; Knox, A.; Stacey, A.R.; Dukes, J.; Baston, E.; Griffin, S.; Vuidepot, A.; Jakobsen, B.K.; Harper, S.
Deposited on	:	2019-05-14
Resolution	:	3.12 Å(reported)

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 3.12 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.
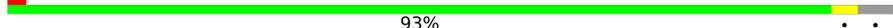
Metric	Percentile Ranks	Value
Rfree		0.252
Clashscore		0
Ramachandran outliers		0.0%
Sidechain outliers		0.8%
RSRZ outliers		0.7%

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	1292 (3.14-3.10)
Clashscore	141614	1389 (3.14-3.10)
Ramachandran outliers	138981	1337 (3.14-3.10)
Sidechain outliers	138945	1337 (3.14-3.10)
RSRZ outliers	127900	1260 (3.14-3.10)

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 <=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	277	98%
1	F	277	3% 99%
2	B	100	99%
2	G	100	98%
3	C	9	89% 11%

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Mol	Chain	Length	Quality of chain
3	H	9	100%
4	D	206	93%
4	I	206	2% 93%
4	K	206	89% 9%
5	E	246	98%
5	J	246	98%
5	L	246	97%

2 Entry composition (i)

There are 5 unique types of molecules in this entry. The entry contains 16633 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 HLA class I histocompatibility antigen, A-2 alpha chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	275	Total 2246	C 1403	N 409	O 425	S 9	0	0	0
1	F	275	Total 2246	C 1403	N 409	O 425	S 9	0	0	0

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	0	MET	-	initiating methionine	UNP P01892
F	0	MET	-	initiating methionine	UNP P01892

- Molecule 2 is a protein called Beta-2-microglobulin.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	100	Total 837	C 533	N 141	O 159	S 4	0	0	0
2	G	100	Total 837	C 533	N 141	O 159	S 4	0	0	0

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	0	MET	-	initiating methionine	UNP P61769
G	0	MET	-	initiating methionine	UNP P61769

- Molecule 3 is a protein called Cancer/testis antigen 1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	C	9	Total 76	C 51	N 11	O 13	S 1	0	0	0
3	H	9	Total 76	C 51	N 11	O 13	S 1	0	0	0

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
C	9	VAL	CYS	conflict	UNP P78358
H	9	VAL	CYS	conflict	UNP P78358

• Molecule 4 is a protein called T-cell receptor alpha chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
4	D	197	Total 1534	C 959	N 253	O 314	S 8	0	0	0
4	I	198	Total 1540	C 962	N 254	O 316	S 8	0	0	0
4	K	187	Total 1455	C 914	N 239	O 294	S 8	0	0	0

• Molecule 5 is a protein called T-cell receptor beta chain.

| Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
5	E	244	Total 1930	C 1208	N 343	O 373	S 6	0	0	0
5	J	244	Total 1930	C 1208	N 343	O 373	S 6	0	0	0
5	L	243	Total 1926	C 1206	N 342	O 372	S 6	0	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.
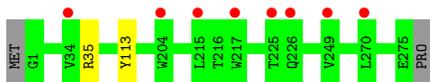
• Molecule 1: HLA class I histocompatibility antigen, A-2 alpha chain

Chain A:

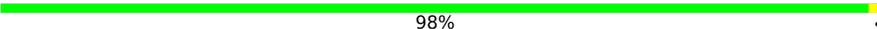• Molecule 1: HLA class I histocompatibility antigen, A-2 alpha chain

Chain F:
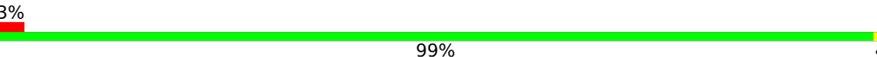
• Molecule 2: Beta-2-microglobulin

Chain B:

• Molecule 2: Beta-2-microglobulin

Chain G:

• Molecule 3: Cancer/testis antigen 1

Chain C:

• Molecule 3: Cancer/testis antigen 1

Chain H:

100%

There are no outlier residues recorded for this chain.

- Molecule 4: T-cell receptor alpha chain

Chain D:

93%

- Molecule 4: T-cell receptor alpha chain
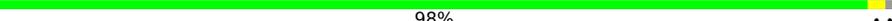
Chain I:

2%

93%

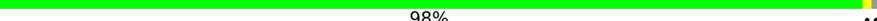- Molecule 4: T-cell receptor alpha chain

Chain K:

89%

9%

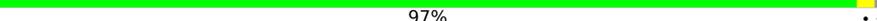- Molecule 5: T-cell receptor beta chain

Chain E:

98%

- Molecule 5: T-cell receptor beta chain

Chain J:

98%

- Molecule 5: T-cell receptor beta chain

Chain L:

97%

4 Data and refinement statistics ⓘ

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α, β, γ	106.57Å 85.61Å 171.92Å 90.00° 91.78° 90.00°	Depositor
Resolution (Å)	68.01 – 3.12 67.91 – 3.12	Depositor EDS
% Data completeness (in resolution range)	99.9 (68.01-3.12) 99.9 (67.91-3.12)	Depositor EDS
R_{merge}	0.12	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.66 (at 3.13Å)	Xtriage
Refinement program	REFMAC 5.8.0158	Depositor
R, R_{free}	0.223 , 0.250 0.225 , 0.252	Depositor DCC
R_{free} test set	2717 reflections (4.89%)	wwPDB-VP
Wilson B-factor (Å^2)	91.7	Xtriage
Anisotropy	0.508	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.29 , 47.4	EDS
L-test for twinning[2]	$< |L| > = 0.50, < L^2 > = 0.33$	Xtriage
Estimated twinning fraction	0.015 for h,-k,-l	Xtriage
F_o,F_c correlation	0.94	EDS
Total number of atoms	16633	wwPDB-VP
Average B, all atoms (Å^2)	121.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.17% of the height of the origin peak. No significant pseudotranslation is detected.*

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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 (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	0.35	0/2311	0.54	0/3137
1	F	0.36	0/2311	0.51	0/3137
2	B	0.32	0/860	0.50	0/1162
2	G	0.34	0/860	0.48	0/1162
3	C	0.35	0/77	0.52	0/103
3	H	0.37	0/77	0.49	0/103
4	D	0.35	0/1569	0.52	0/2129
4	I	0.36	0/1575	0.52	0/2137
4	K	0.36	0/1489	0.54	0/2021
5	E	0.34	0/1981	0.55	0/2694
5	J	0.35	0/1981	0.53	0/2694
5	L	0.34	0/1977	0.54	0/2689
All	All	0.35	0/17068	0.53	0/23168

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	2246	0	2096	1	0
1	F	2246	0	2096	0	0
2	B	837	0	803	0	0
2	G	837	0	803	1	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	C	76	0	83	1	0
3	H	76	0	83	0	0
4	D	1534	0	1441	2	0
4	I	1540	0	1444	2	0
4	K	1455	0	1365	1	0
5	E	1930	0	1832	1	0
5	J	1930	0	1832	1	0
5	L	1926	0	1826	1	0
All	All	16633	0	15704	10	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 0.

The worst 5 of 10 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)
5:J:21:LEU:HD22	5:J:122:THR:HG21	1.87	0.56
5:E:21:LEU:HD22	5:E:122:THR:HG21	1.91	0.53
5:L:21:LEU:HD22	5:L:122:THR:HG21	1.98	0.46
1:A:80:THR:HG21	3:C:9:VAL:OXT	2.17	0.45
4:I:43:ARG:HB2	4:I:53:ILE:HD11	2.00	0.43

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	273/277 (99%)	259 (95%)	14 (5%)	0	100	100
1	F	273/277 (99%)	253 (93%)	20 (7%)	0	100	100
2	B	98/100 (98%)	96 (98%)	2 (2%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
2	G	98/100 (98%)	96 (98%)	2 (2%)	0	100	100
3	C	7/9 (78%)	7 (100%)	0	0	100	100
3	H	7/9 (78%)	7 (100%)	0	0	100	100
4	D	195/206 (95%)	181 (93%)	14 (7%)	0	100	100
4	I	196/206 (95%)	181 (92%)	15 (8%)	0	100	100
4	K	183/206 (89%)	166 (91%)	17 (9%)	0	100	100
5	E	242/246 (98%)	231 (96%)	10 (4%)	1 (0%)	34	68
5	J	242/246 (98%)	232 (96%)	10 (4%)	0	100	100
5	L	241/246 (98%)	227 (94%)	14 (6%)	0	100	100
All	All	2055/2128 (97%)	1936 (94%)	118 (6%)	1 (0%)	100	100

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
5	E	66	GLN

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	231/233 (99%)	229 (99%)	2 (1%)	78	91
1	F	231/233 (99%)	229 (99%)	2 (1%)	78	91
2	B	95/95 (100%)	94 (99%)	1 (1%)	73	88
2	G	95/95 (100%)	95 (100%)	0	100	100
3	C	9/9 (100%)	9 (100%)	0	100	100
3	H	9/9 (100%)	9 (100%)	0	100	100
4	D	175/184 (95%)	174 (99%)	1 (1%)	86	93
4	I	176/184 (96%)	174 (99%)	2 (1%)	73	88
4	K	165/184 (90%)	164 (99%)	1 (1%)	86	93

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles		
5	E	208/210 (99%)	207 (100%)	1 (0%)		88	94
5	J	208/210 (99%)	207 (100%)	1 (0%)		88	94
5	L	208/210 (99%)	205 (99%)	3 (1%)		67	85
All	All	1810/1856 (98%)	1796 (99%)	14 (1%)		81	92

5 of 14 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
4	I	116	PHE
4	I	159	GLN
5	L	206	ARG
5	L	55	TYR
5	L	104	CYS

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

Mol	Chain	Res	Type
1	F	43	GLN
4	I	115	GLN
4	K	207	ASN
4	D	131	GLN
4	D	115	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 ⓘ

There are no ligands in this entry.

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(Å²)	Q<0.9
1	A	275/277 (99%)	0.03	0	100	100	67, 104, 165, 188	0
1	F	275/277 (99%)	0.13	8 (2%)	51	29	109, 140, 193, 220	0
2	B	100/100 (100%)	-0.05	0	100	100	66, 91, 136, 151	0
2	G	100/100 (100%)	0.08	0	100	100	112, 136, 192, 204	0
3	C	9/9 (100%)	0.23	0	100	100	72, 78, 84, 85	0
3	H	9/9 (100%)	0.08	0	100	100	108, 115, 118, 119	0
4	D	197/206 (95%)	0.17	1 (0%)	91	82	75, 107, 176, 188	0
4	I	198/206 (96%)	0.18	4 (2%)	65	45	111, 138, 169, 182	0
4	K	187/206 (90%)	0.11	1 (0%)	91	82	85, 118, 168, 187	0
5	E	244/246 (99%)	0.07	1 (0%)	92	85	70, 95, 152, 172	0
5	J	244/246 (99%)	-0.09	0	100	100	100, 121, 142, 151	0
5	L	243/246 (98%)	0.07	0	100	100	88, 111, 144, 164	0
All	All	2081/2128 (97%)	0.07	15 (0%)	87	77	66, 119, 172, 220	0

The worst 5 of 15 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
4	I	205	PHE	3.7
1	F	217	TRP	3.4
4	I	165	SER	3.1
4	I	196	LYS	3.0
1	F	215	LEU	2.9

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.

6.4 Ligands ⓘ

There are no ligands in this entry.

6.5 Other polymers ⓘ

There are no such residues in this entry.