



wwPDB X-ray Structure Validation Summary Report

Feb 27, 2014 – 12:38 PM GMT

PDB ID : 1KV3
Title : HUMAN TISSUE TRANSGLUTAMINASE IN GDP BOUND FORM
Authors : Liu, S.; Cerione, R.A.; Clardy, J.
Deposited on : 2002-01-24
Resolution : 2.80 Å(reported)

This is a wwPDB validation summary report for a publicly released PDB entry.

We welcome your comments at validation@mail.wwpdb.org

A user guide is available at <http://wwpdb.org/ValidationPDFNotes.html>

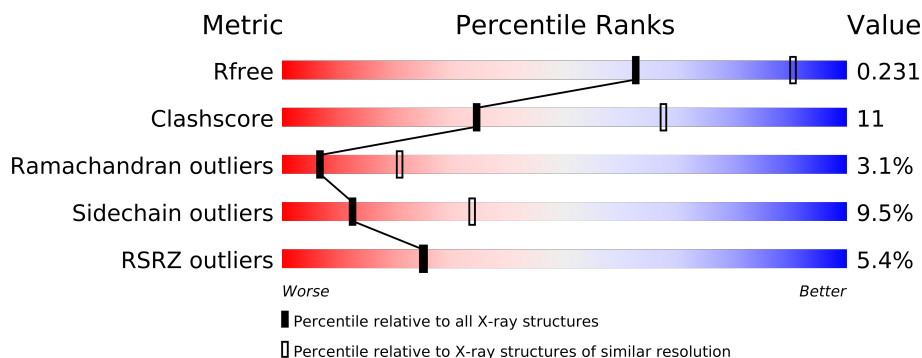
The following versions of software and data (see [references](#)) were used in the production of this report:

MolProbity : 4.02b-467
Mogul : 1.15 2013
Xtriage (Phenix) : dev-1323
EDS : stable22639
Percentile statistics : 21963
Refmac : 5.8.0049
CCP4 : 6.3.0 (Settle)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et. al. (1996)
Validation Pipeline (wwPDB-VP) : stable22683

1 Overall quality at a glance

The reported resolution of this entry is 2.80 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}	66092	1799 (2.80-2.80)
Clashscore	79885	2295 (2.80-2.80)
Ramachandran outliers	78287	2252 (2.80-2.80)
Sidechain outliers	78261	2254 (2.80-2.80)
RSRZ outliers	66119	1802 (2.80-2.80)

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 ≥ 3 , 2, 1 and 0 types of geometric quality criteria. The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density.

Mol	Chain	Length	Quality of chain
1	A	687	
1	B	687	
1	C	687	
1	D	687	
1	E	687	
1	F	687	

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 31466 atoms, of which 0 are hydrogen and 0 are deuterium.

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 Protein-glutamine gamma-glutamyltransferase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	651	Total	C	N	O	S	0	0	0
			5145	3251	889	976	29			
1	B	651	Total	C	N	O	S	0	0	0
			5145	3251	889	976	29			
1	C	651	Total	C	N	O	S	0	0	0
			5145	3251	889	976	29			
1	D	651	Total	C	N	O	S	0	0	0
			5145	3251	889	976	29			
1	E	651	Total	C	N	O	S	0	0	0
			5145	3251	889	976	29			
1	F	651	Total	C	N	O	S	0	0	0
			5145	3251	889	976	29			

There are 30 discrepancies between the modelled and reference sequences:

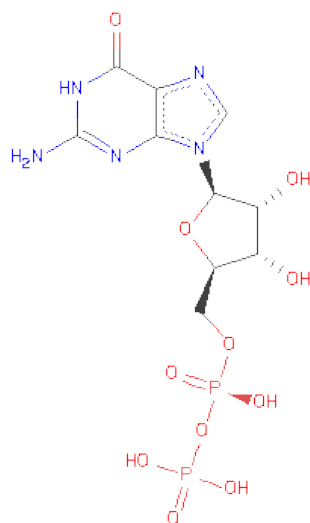
Chain	Residue	Modelled	Actual	Comment	Reference
A	51	GLN	GLU	SEE REMARK 999	UNP P21980
A	186	GLN	GLU	SEE REMARK 999	UNP P21980
A	224	GLY	VAL	SEE REMARK 999	UNP P21980
A	533	THR	ASN	SEE REMARK 999	UNP P21980
A	655	VAL	LEU	SEE REMARK 999	UNP P21980
B	51	GLN	GLU	SEE REMARK 999	UNP P21980
B	186	GLN	GLU	SEE REMARK 999	UNP P21980
B	224	GLY	VAL	SEE REMARK 999	UNP P21980
B	533	THR	ASN	SEE REMARK 999	UNP P21980
B	655	VAL	LEU	SEE REMARK 999	UNP P21980
C	51	GLN	GLU	SEE REMARK 999	UNP P21980
C	186	GLN	GLU	SEE REMARK 999	UNP P21980
C	224	GLY	VAL	SEE REMARK 999	UNP P21980
C	533	THR	ASN	SEE REMARK 999	UNP P21980
C	655	VAL	LEU	SEE REMARK 999	UNP P21980
D	51	GLN	GLU	SEE REMARK 999	UNP P21980
D	186	GLN	GLU	SEE REMARK 999	UNP P21980

Continued on next page...

Continued from previous page...

Chain	Residue	Modelled	Actual	Comment	Reference
D	224	GLY	VAL	SEE REMARK 999	UNP P21980
D	533	THR	ASN	SEE REMARK 999	UNP P21980
D	655	VAL	LEU	SEE REMARK 999	UNP P21980
E	51	GLN	GLU	SEE REMARK 999	UNP P21980
E	186	GLN	GLU	SEE REMARK 999	UNP P21980
E	224	GLY	VAL	SEE REMARK 999	UNP P21980
E	533	THR	ASN	SEE REMARK 999	UNP P21980
E	655	VAL	LEU	SEE REMARK 999	UNP P21980
F	51	GLN	GLU	SEE REMARK 999	UNP P21980
F	186	GLN	GLU	SEE REMARK 999	UNP P21980
F	224	GLY	VAL	SEE REMARK 999	UNP P21980
F	533	THR	ASN	SEE REMARK 999	UNP P21980
F	655	VAL	LEU	SEE REMARK 999	UNP P21980

- Molecule 2 is GUANOSINE-5'-DIPHOSPHATE (three-letter code: GDP) (formula: $C_{10}H_{15}N_5O_{11}P_2$).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	A	1	Total	C	N	O	P	0	0
			28	10	5	11	2		
2	B	1	Total	C	N	O	P	0	0
			28	10	5	11	2		
2	C	1	Total	C	N	O	P	0	0
			28	10	5	11	2		
2	D	1	Total	C	N	O	P	0	0
			28	10	5	11	2		

Continued on next page...

Continued from previous page...

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	E	1	Total	C	N	O	P	0	0
			28	10	5	11	2		
2	F	1	Total	C	N	O	P	0	0
			28	10	5	11	2		

- Molecule 3 is water.

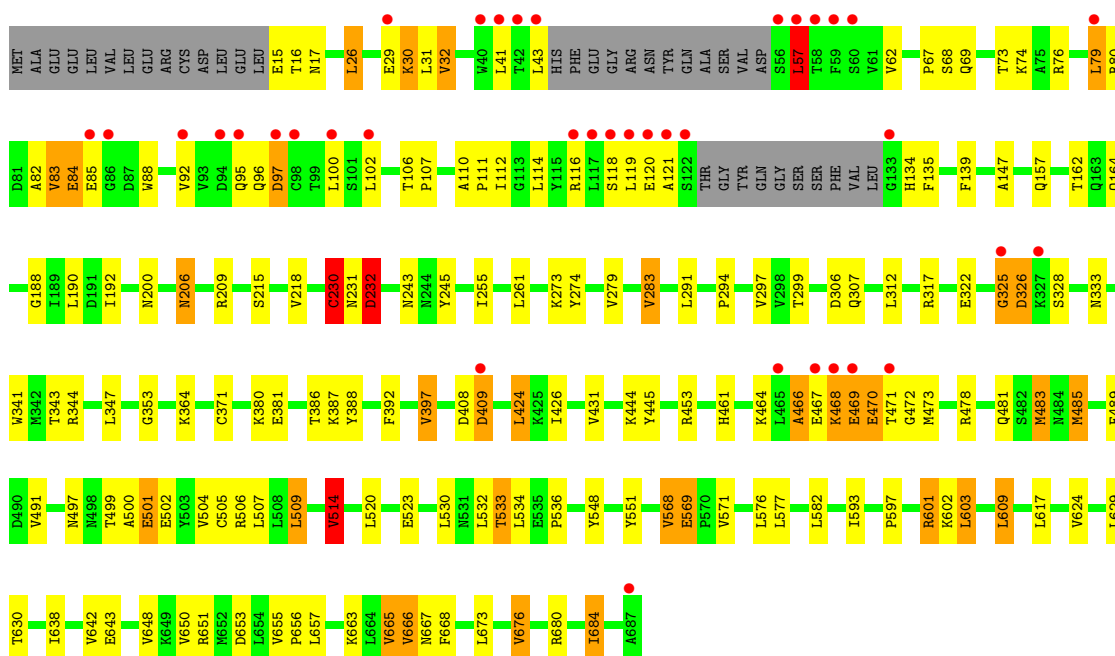
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	64	Total	O	0	0
			64	64		
3	B	68	Total	O	0	0
			68	68		
3	C	104	Total	O	0	0
			104	104		
3	D	66	Total	O	0	0
			66	66		
3	E	72	Total	O	0	0
			72	72		
3	F	54	Total	O	0	0
			54	54		

3 Residue-property plots

These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of errors 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.

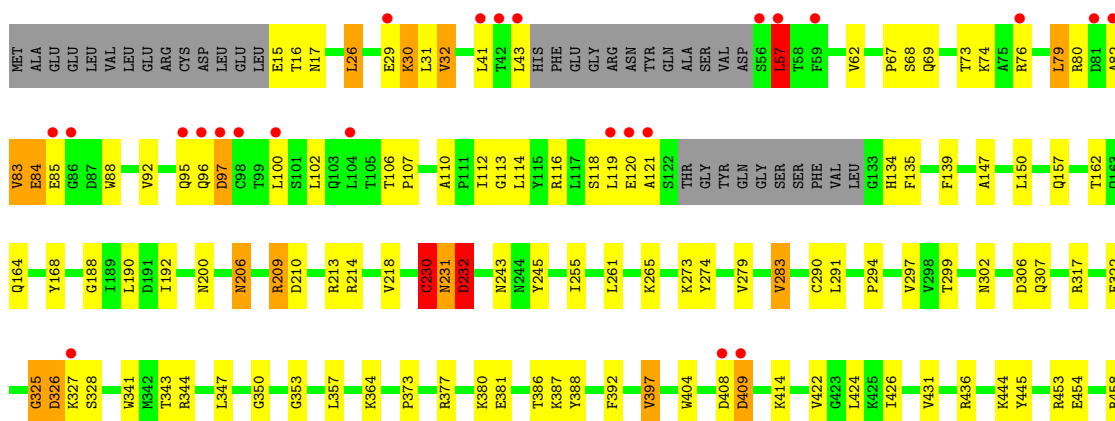
- Molecule 1: Protein-glutamine gamma-glutamyltransferase

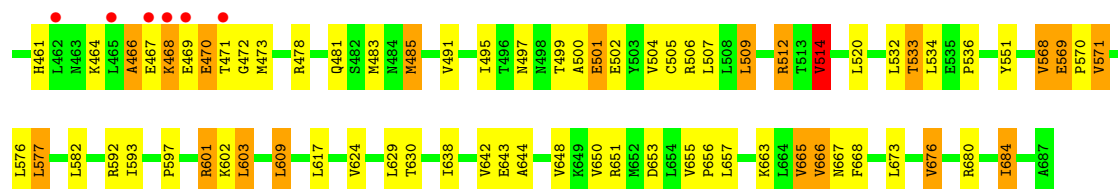
Chain A:



- Molecule 1: Protein-glutamine gamma-glutamyltransferase

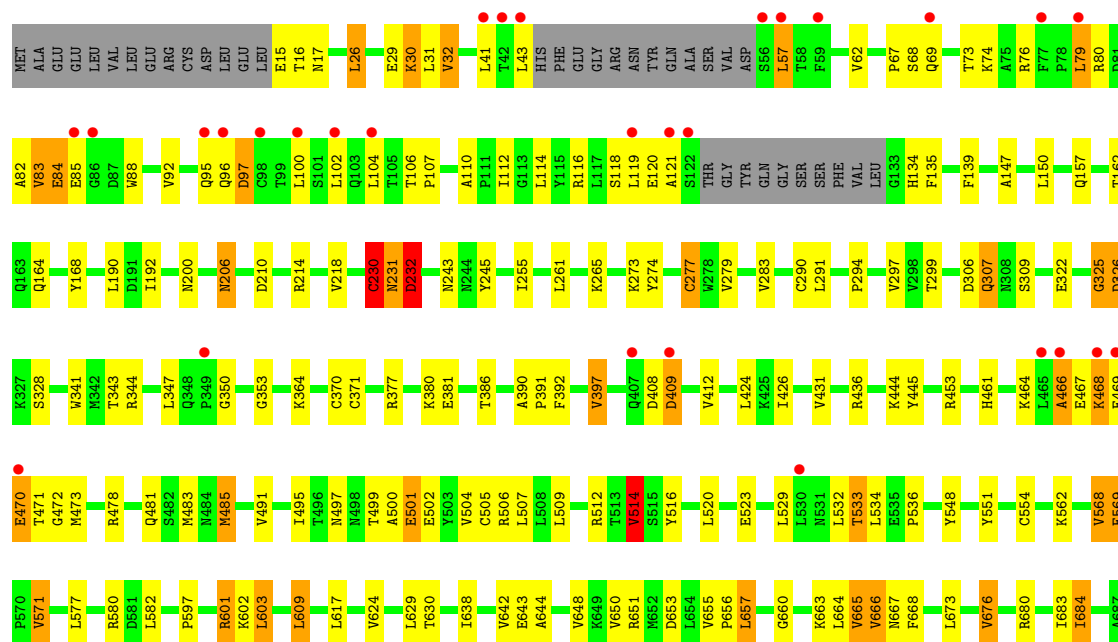
Chain B:





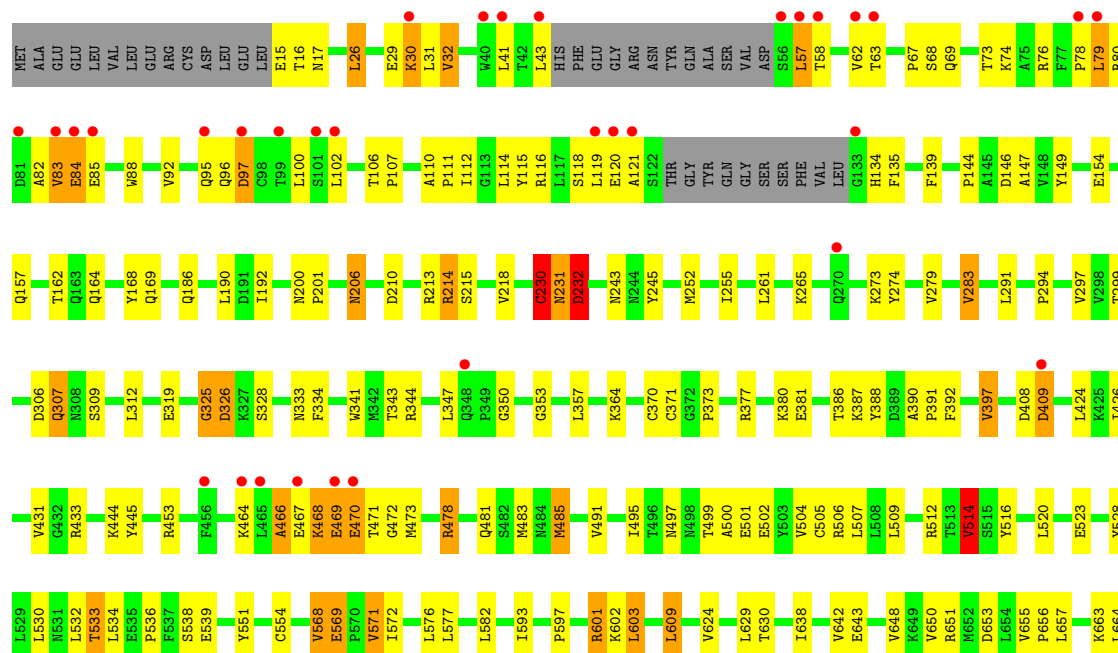
• Molecule 1: Protein-glutamine gamma-glutamyltransferase

Chain C:



• Molecule 1: Protein-glutamine gamma-glutamyltransferase

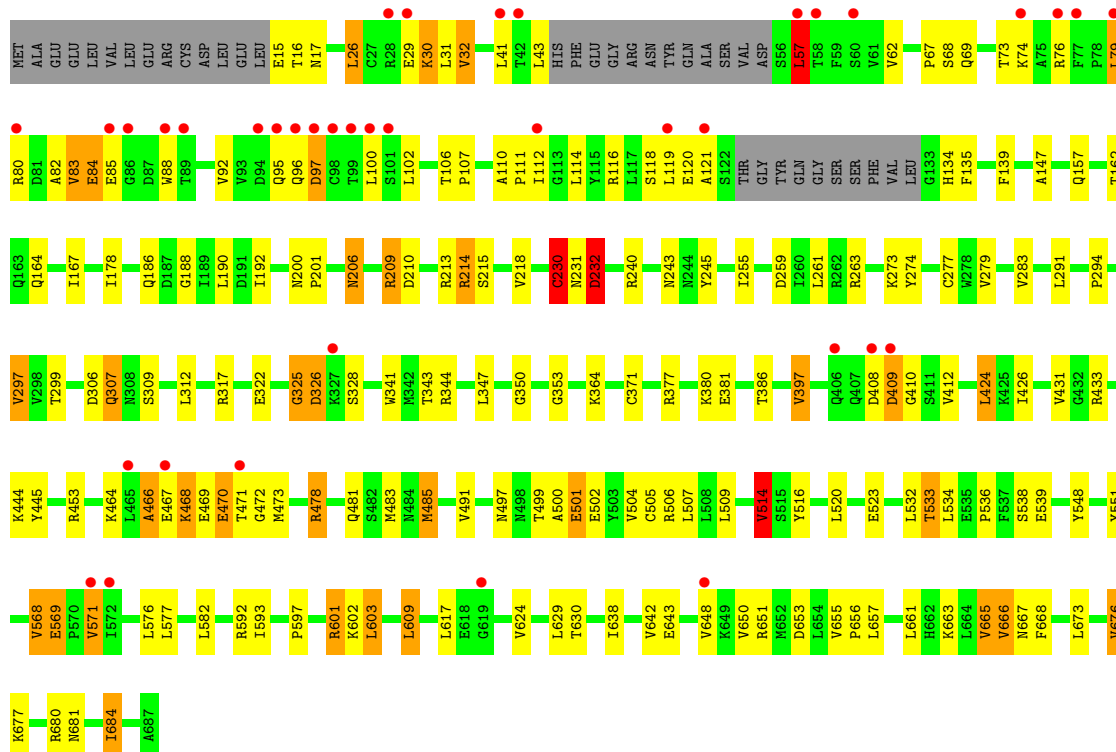
Chain D:





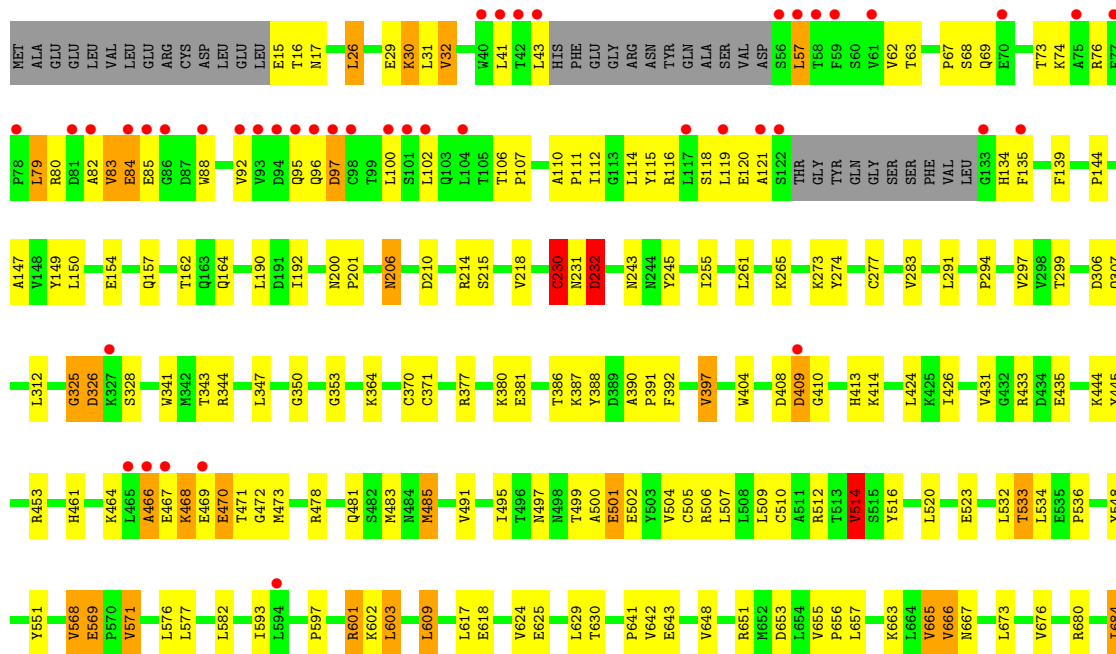
• Molecule 1: Protein-glutamine gamma-glutamyltransferase

Chain E:



• Molecule 1: Protein-glutamine gamma-glutamyltransferase

Chain F:



1687

4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	132.48Å 168.80Å 238.57Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	51.79 – 2.80 51.79 – 2.80	Depositor EDS
% Data completeness (in resolution range)	94.6 (51.79-2.80) 94.7 (51.79-2.80)	Depositor EDS
R_{merge}	0.09	Depositor
R_{sym}	0.09	Depositor
$\langle I/\sigma(I) \rangle$ ¹	4.20 (at 2.81Å)	Xtriage
Refinement program	CNS 1.0	Depositor
R, R_{free}	0.233 , 0.272 0.233 , 0.231	Depositor DCC
R_{free} test set	6274 reflections (5.02%)	DCC
Wilson B-factor (Å ²)	58.6	Xtriage
Anisotropy	0.394	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.30 , 21.6	EDS
Estimated twinning fraction	No twinning to report.	Xtriage
L-test for twinning	$\langle L \rangle = 0.51$, $\langle L^2 \rangle = 0.35$	Xtriage
Outliers	1 of 124870 reflections (0.001%)	Xtriage
F_o, F_c correlation	0.93	EDS
Total number of atoms	31466	wwPDB-VP
Average B, all atoms (Å ²)	57.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 6.74% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

5 Model quality ⓘ

5.1 Standard geometry ⓘ

Bond lengths and bond angles in the following residue types are not validated in this section: GDP

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	0.63	0/5256	0.80	5/7131 (0.1%)
1	B	0.65	1/5256 (0.0%)	0.80	5/7131 (0.1%)
1	C	0.69	4/5256 (0.1%)	0.82	4/7131 (0.1%)
1	D	0.66	2/5256 (0.0%)	0.81	4/7131 (0.1%)
1	E	0.63	0/5256	0.80	5/7131 (0.1%)
1	F	0.64	2/5256 (0.0%)	0.81	4/7131 (0.1%)
All	All	0.65	9/31536 (0.0%)	0.81	27/42786 (0.1%)

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	B	0	1
1	C	0	1
1	D	0	1
All	All	0	3

The worst 5 of 9 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	290	CYS	CB-SG	-8.31	1.68	1.82
1	C	370	CYS	CB-SG	-7.34	1.69	1.82
1	D	554	CYS	CB-SG	-6.28	1.71	1.82
1	C	277	CYS	CB-SG	-5.95	1.72	1.81
1	F	510	CYS	CB-SG	-5.90	1.72	1.81

The worst 5 of 27 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	F	307	GLN	N-CA-C	-6.58	93.22	111.00
1	A	307	GLN	N-CA-C	-6.55	93.31	111.00
1	B	514	VAL	CB-CA-C	-6.43	99.18	111.40
1	E	307	GLN	N-CA-C	-6.28	94.05	111.00
1	B	307	GLN	N-CA-C	-6.27	94.07	111.00

There are no chirality outliers.

All (3) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	B	168	TYR	Sidechain
1	C	168	TYR	Sidechain
1	D	168	TYR	Sidechain

5.2 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 hydrogens added by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, and the number in parentheses is this value normalized per 1000 atoms of the molecule in the chain. The Symm-Clashes column gives symmetry related clashes, in the same way as for the Clashes column.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	5145	0	5060	104	0
1	B	5145	0	5060	116	0
1	C	5145	0	5060	110	0
1	D	5145	0	5060	122	0
1	E	5145	0	5060	117	0
1	F	5145	0	5060	105	0
2	A	28	0	12	0	0
2	B	28	0	12	0	0
2	C	28	0	12	0	0
2	D	28	0	12	0	0
2	E	28	0	12	0	0
2	F	28	0	12	0	0
3	A	64	0	0	1	0
3	B	68	0	0	6	0
3	C	104	0	0	4	0
3	D	66	0	0	5	0
3	E	72	0	0	4	0
3	F	54	0	0	1	0

Continued on next page...

Continued from previous page...

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
All	All	31466	0	30432	665	0

Clashscore is defined as the number of clashes calculated for the entry per 1000 atoms (including hydrogens) of the entry. The overall clashscore for this entry is 11.

The worst 5 of 665 close contacts within the same asymmetric unit are listed below.

Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:D:83:VAL:HG13	1:D:84:GLU:H	1.32	0.95
1:F:83:VAL:HG13	1:F:84:GLU:H	1.31	0.94
1:E:83:VAL:HG13	1:E:84:GLU:H	1.32	0.94
1:B:83:VAL:HG13	1:B:84:GLU:H	1.31	0.94
1:C:83:VAL:HG13	1:C:84:GLU:H	1.33	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	645/687 (94%)	584 (90%)	42 (6%)	19 (3%)	7	23
1	B	645/687 (94%)	587 (91%)	38 (6%)	20 (3%)	7	21
1	C	645/687 (94%)	588 (91%)	37 (6%)	20 (3%)	7	21
1	D	645/687 (94%)	585 (91%)	39 (6%)	21 (3%)	6	19
1	E	645/687 (94%)	587 (91%)	37 (6%)	21 (3%)	6	19
1	F	645/687 (94%)	587 (91%)	38 (6%)	20 (3%)	7	21
All	All	3870/4122 (94%)	3518 (91%)	231 (6%)	121 (3%)	7	21

5 of 121 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	83	VAL
1	A	85	GLU

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type
1	A	96	GLN
1	A	121	ALA
1	A	231	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	565/596 (95%)	512 (91%)	53 (9%)	13	34
1	B	565/596 (95%)	510 (90%)	55 (10%)	12	32
1	C	565/596 (95%)	512 (91%)	53 (9%)	13	34
1	D	565/596 (95%)	511 (90%)	54 (10%)	12	33
1	E	565/596 (95%)	510 (90%)	55 (10%)	12	32
1	F	565/596 (95%)	512 (91%)	53 (9%)	13	34
All	All	3390/3576 (95%)	3067 (90%)	323 (10%)	12	33

5 of 323 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	C	577	LEU
1	D	283	VAL
1	F	453	ARG
1	C	617	LEU
1	D	57	LEU

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 65 such sidechains are listed below:

Mol	Chain	Res	Type
1	C	266	ASN
1	D	186	GLN
1	F	234	GLN
1	C	348	GLN
1	D	69	GLN

5.3.3 RNA ⓘ

There are no RNA chains 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 carbohydrates in this entry.

5.6 Ligand geometry ⓘ

6 ligands 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$
2	GDP	A	700	-	30,30,30	1.28	4 (13%)	44,47,47	4.67	5 (11%)
2	GDP	B	701	-	30,30,30	1.23	3 (10%)	44,47,47	5.63	4 (9%)
2	GDP	C	702	-	30,30,30	1.35	4 (13%)	44,47,47	5.67	4 (9%)
2	GDP	D	703	-	30,30,30	1.23	3 (10%)	44,47,47	4.82	4 (9%)
2	GDP	E	704	-	30,30,30	1.25	2 (6%)	44,47,47	4.93	4 (9%)
2	GDP	F	705	-	30,30,30	1.27	3 (10%)	44,47,47	5.49	4 (9%)

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	GDP	A	700	-	-	0/16/32/32	0/1/3/3
2	GDP	B	701	-	-	0/16/32/32	0/1/3/3
2	GDP	C	702	-	-	0/16/32/32	0/1/3/3

Continued on next page...

Continued from previous page...

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	GDP	D	703	-	-	0/16/32/32	0/1/3/3
2	GDP	E	704	-	-	0/16/32/32	0/1/3/3
2	GDP	F	705	-	-	0/16/32/32	0/1/3/3

The worst 5 of 19 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	C	702	GDP	C8-N7	-3.39	1.27	1.34
2	B	701	GDP	C8-N7	-3.39	1.27	1.34
2	E	704	GDP	C8-N7	-3.36	1.28	1.34
2	A	700	GDP	C8-N7	-3.14	1.28	1.34
2	F	705	GDP	PB-O2B	-3.03	1.43	1.54

The worst 5 of 25 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	C	702	GDP	C6-C5-N7	-36.89	129.17	134.14
2	B	701	GDP	C6-C5-N7	-36.67	129.20	134.14
2	F	705	GDP	C6-C5-N7	-35.69	129.33	134.14
2	E	704	GDP	C6-C5-N7	-31.93	129.84	134.14
2	D	703	GDP	C6-C5-N7	-31.23	129.94	134.14

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

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	651/687 (94%)	0.01	37 (5%) 23 23	22, 53, 108, 141	0
1	B	651/687 (94%)	0.08	30 (4%) 31 31	23, 52, 107, 140	0
1	C	651/687 (94%)	-0.01	29 (4%) 32 33	21, 48, 106, 140	0
1	D	651/687 (94%)	0.08	33 (5%) 27 27	22, 52, 107, 142	0
1	E	651/687 (94%)	0.05	38 (5%) 22 22	28, 53, 106, 141	0
1	F	651/687 (94%)	0.09	43 (6%) 18 16	21, 52, 107, 142	0
All	All	3906/4122 (94%)	0.05	210 (5%) 25 25	21, 52, 107, 142	0

The worst 5 of 210 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	85	GLU	7.2
1	A	467	GLU	7.1
1	D	465	LEU	6.3
1	F	100	LEU	6.1
1	F	57	LEU	5.8

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 carbohydrates in this entry.

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. 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, 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	RSR	LLDF	B-factors(Å ²)	Q<0.9
2	GDP	C	702	28/28	0.15	-0.30	27,37,50,53	0
2	GDP	A	700	28/28	0.14	-0.81	29,36,54,55	0
2	GDP	E	704	28/28	0.13	-0.82	32,42,51,58	0
2	GDP	D	703	28/28	0.14	-0.97	25,34,51,57	0
2	GDP	F	705	28/28	0.13	-1.09	33,38,45,57	0
2	GDP	B	701	28/28	0.13	-1.45	20,36,48,53	0

6.5 Other polymers

There are no such residues in this entry.