



wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 5, 2026 – 06:30 PM UTC

PDB ID : 1FLL / pdb_00001fl
Title : MOLECULAR BASIS FOR CD40 SIGNALING MEDIATED BY TRAF3
Authors : Ni, C.-Z.; Welsh, K.; Leo, E.; Chiou, C.-K.; Wu, H.; Reed, J.C.; Ely, K.R.
Deposited on : 2000-08-14
Resolution : 3.50 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

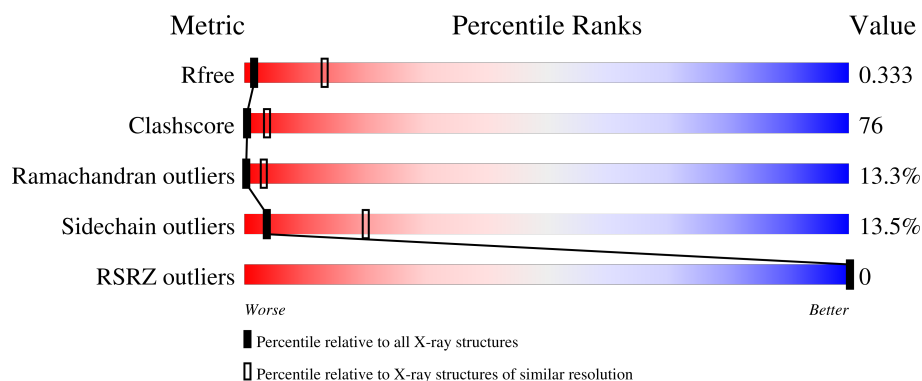
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 3.50 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	1085 (3.54-3.46)
Clashscore	190562	1140 (3.54-3.46)
Ramachandran outliers	187476	1113 (3.54-3.46)
Sidechain outliers	187428	1114 (3.54-3.46)
RSRZ outliers	180081	1084 (3.54-3.46)

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	228	
1	B	228	
2	X	21	
2	Y	21	

2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 3558 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 TNF RECEPTOR ASSOCIATED FACTOR 3.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	205	Total	C	N	O	S	0	0	0
			1626	1035	277	303	11			
1	B	205	Total	C	N	O	S	0	0	0
			1626	1035	277	303	11			

- Molecule 2 is a protein called B-CELL SURFACE ANTIGEN CD40.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
2	X	21	Total	C	N	O	0	0	0
			153	92	27	34			
2	Y	21	Total	C	N	O	0	0	0
			153	92	27	34			

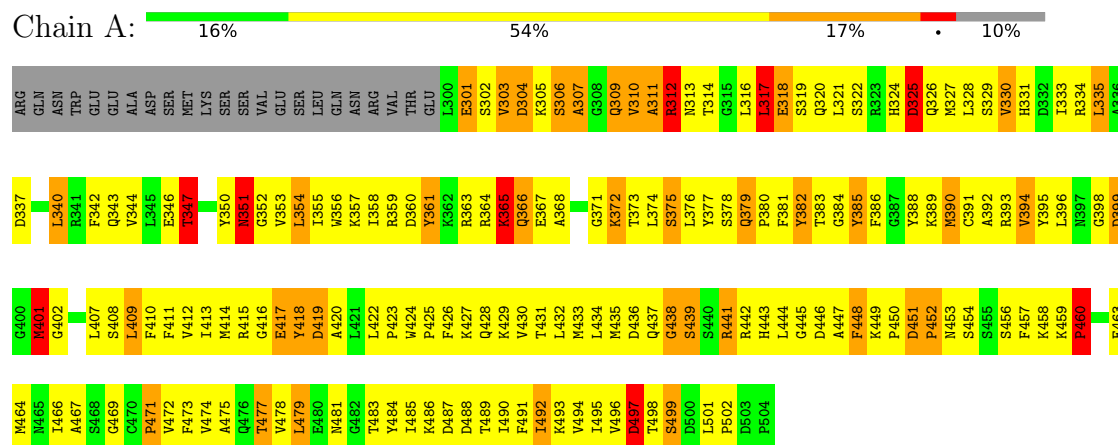
There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
X	246	LYS	ASN	engineered mutation	UNP P25942
X	258	SER	CYS	engineered mutation	UNP P25942
Y	246	LYS	ASN	engineered mutation	UNP P25942
Y	258	SER	CYS	engineered mutation	UNP P25942

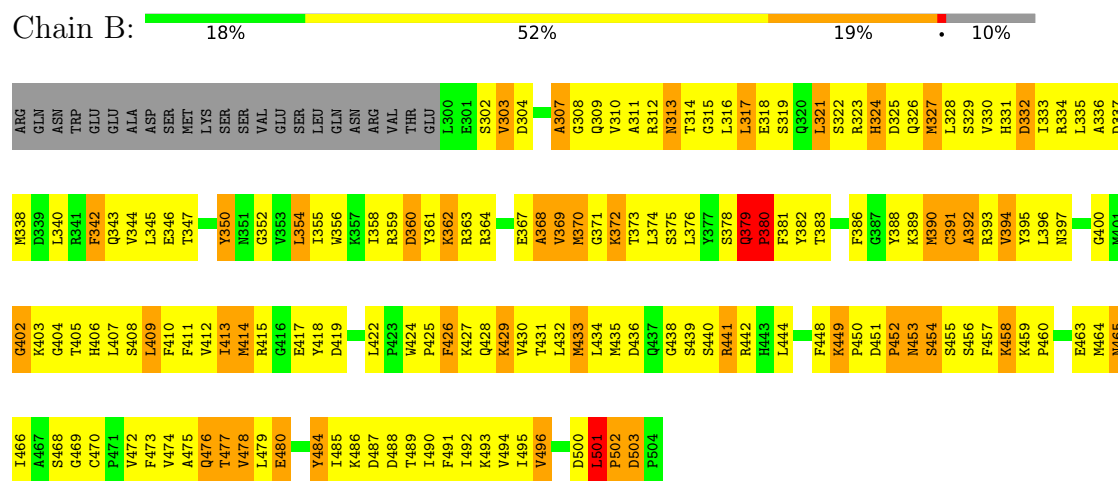
3 Residue-property plots

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.

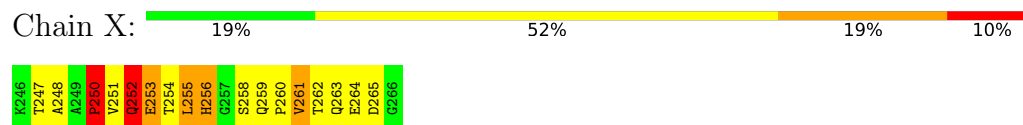
• Molecule 1: TNF RECEPTOR ASSOCIATED FACTOR 3



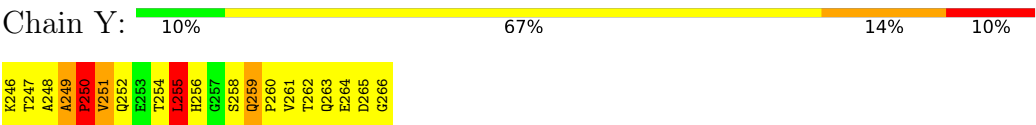
• Molecule 1: TNF RECEPTOR ASSOCIATED FACTOR 3



• Molecule 2: B-CELL SURFACE ANTIGEN CD40



● Molecule 2: B-CELL SURFACE ANTIGEN CD40



4 Data and refinement statistics

Property	Value	Source
Space group	P 3 2 1	Depositor
Cell constants a, b, c, α , β , γ	83.76Å 83.76Å 212.57Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	8.00 – 3.50 8.00 – 3.50	Depositor EDS
% Data completeness (in resolution range)	72.6 (8.00-3.50) 82.5 (8.00-3.50)	Depositor EDS
R_{merge}	0.08	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	4.44 (at 3.48Å)	Xtriage
Refinement program	CNS	Depositor
R, R_{free}	0.173 , 0.312 0.226 , 0.333	Depositor DCC
R_{free} test set	432 reflections (4.58%)	wwPDB-VP
Wilson B-factor (Å ²)	56.7	Xtriage
Anisotropy	0.980	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.36 , 89.6	EDS
L-test for twinning ²	$\langle L \rangle = 0.44$, $\langle L^2 \rangle = 0.27$	Xtriage
Estimated twinning fraction	0.398 for -h,-k,l	Xtriage
F_o, F_c correlation	0.93	EDS
Total number of atoms	3558	wwPDB-VP
Average B, all atoms (Å ²)	33.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 7.20% 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	0.49	0/1661	1.19	27/2239 (1.2%)
1	B	0.49	0/1661	1.02	7/2239 (0.3%)
2	X	0.67	0/155	1.23	1/211 (0.5%)
2	Y	0.94	0/155	1.24	3/211 (1.4%)
All	All	0.53	0/3632	1.12	38/4900 (0.8%)

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	1
2	X	0	1
All	All	0	2

There are no bond length outliers.

The worst 5 of 38 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	419	ASP	N-CA-C	-9.57	99.73	111.40
1	B	368	ALA	N-CA-C	-8.90	101.15	111.03
1	B	313	ASN	N-CA-C	-8.56	101.91	111.07
1	A	307	ALA	N-CA-C	-8.53	101.92	111.82
1	B	332	ASP	N-CA-C	-8.41	102.04	111.71

There are no chirality outliers.

All (2) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	388	TYR	Sidechain
2	X	264	GLU	Peptide

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	1626	0	1622	252	0
1	B	1626	0	1622	250	0
2	X	153	0	144	26	0
2	Y	153	0	144	27	0
All	All	3558	0	3532	537	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 76.

The worst 5 of 537 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)
2:X:254:THR:OG1	2:X:265:ASP:HB2	1.40	1.19
1:A:466:ILE:HG23	2:X:253:GLU:HB2	1.37	1.07
1:B:312:ARG:HE	1:B:312:ARG:HA	1.24	1.02
2:X:252:GLN:HE21	2:X:252:GLN:N	1.59	1.00
1:B:410:PHE:HA	1:B:469:GLY:HA3	1.45	0.96

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	203/228 (89%)	144 (71%)	36 (18%)	23 (11%)	0 5
1	B	203/228 (89%)	139 (68%)	38 (19%)	26 (13%)	0 3

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
2	X	19/21 (90%)	9 (47%)	4 (21%)	6 (32%)	0	0
2	Y	19/21 (90%)	7 (37%)	8 (42%)	4 (21%)	0	1
All	All	444/498 (89%)	299 (67%)	86 (19%)	59 (13%)	0	3

5 of 59 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	301	GLU
1	A	318	GLU
1	A	319	SER
1	A	371	GLY
1	A	417	GLU

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	179/201 (89%)	156 (87%)	23 (13%)	4	21
1	B	179/201 (89%)	157 (88%)	22 (12%)	4	22
2	X	17/17 (100%)	12 (71%)	5 (29%)	0	2
2	Y	17/17 (100%)	14 (82%)	3 (18%)	2	11
All	All	392/436 (90%)	339 (86%)	53 (14%)	4	20

5 of 53 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	317	LEU
1	B	379	GLN
1	B	501	LEU
1	B	321	LEU
1	B	350	TYR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 18 such sidechains are listed below:

Mol	Chain	Res	Type
1	B	428	GLN
2	Y	252	GLN
1	B	476	GLN
2	X	256	HIS
1	B	397	ASN

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 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 [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, 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	205/228 (89%)	-1.05	0 100 100	15, 33, 67, 76	0
1	B	205/228 (89%)	-0.96	0 100 100	15, 33, 67, 76	0
2	X	21/21 (100%)	-0.59	0 100 100	13, 15, 17, 48	0
2	Y	21/21 (100%)	-0.76	0 100 100	13, 15, 17, 48	0
All	All	452/498 (90%)	-0.97	0 100 100	13, 31, 67, 76	0

There are no RSRZ outliers to report.

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 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.