



Full wwPDB X-ray Structure Validation Report ⓘ

Jun 24, 2025 – 01:36 pm BST

PDB ID : 5TNZ / pdb_00005tnz
Title : HtrA2 S142D mutant
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Deposited on : 2016-10-15
Resolution : 1.75 Å(reported)

This is a Full wwPDB X-ray Structure Validation 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 Phenix2.0rc1
Mogul : 1.8.4, CSD as541be (2020)
Xtriage (Phenix) : 2.0rc1
EDS : 3.0
Percentile statistics : 20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4 : 9.0.003 (Gargrove)
Density-Fitness : 1.0.11
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.44

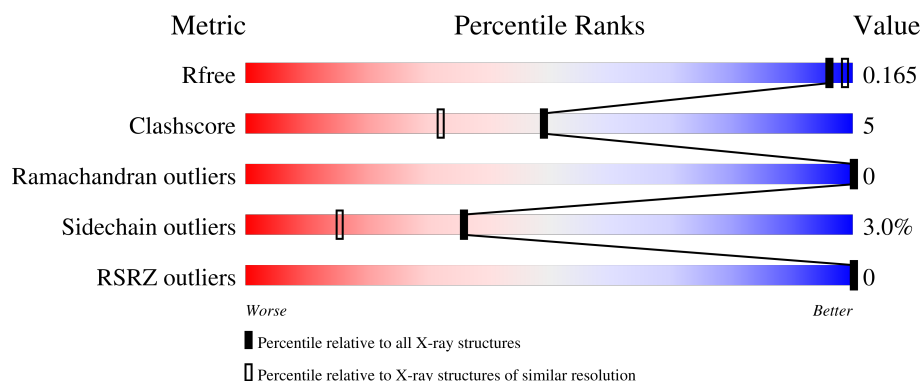
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.75 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}	164625	2888 (1.76-1.76)
Clashscore	180529	3097 (1.76-1.76)
Ramachandran outliers	177936	3072 (1.76-1.76)
Sidechain outliers	177891	3072 (1.76-1.76)
RSRZ outliers	164620	2887 (1.76-1.76)

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	332	 75% 13% 12%

2 Entry composition [i](#)

There are 4 unique types of molecules in this entry. The entry contains 2387 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.

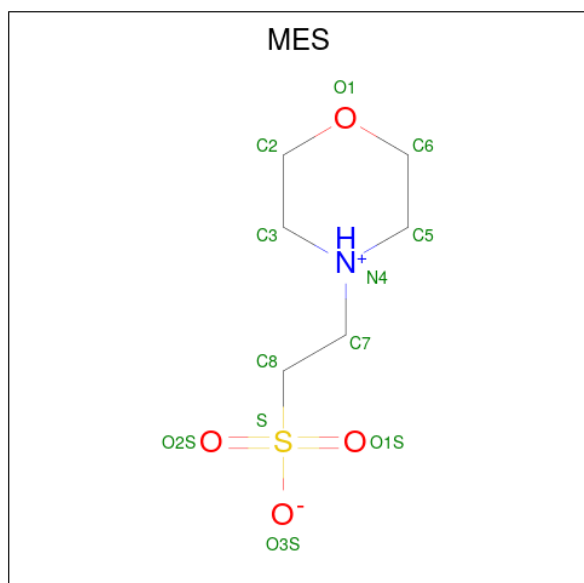
- Molecule 1 is a protein called Serine protease HTRA2, mitochondrial.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	293	2242	1420	393	424	5	0	8	0

There are 8 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	133	MET	-	initiating methionine	UNP O43464
A	142	ASP	SER	engineered mutation	UNP O43464
A	459	HIS	-	expression tag	UNP O43464
A	460	HIS	-	expression tag	UNP O43464
A	461	HIS	-	expression tag	UNP O43464
A	462	HIS	-	expression tag	UNP O43464
A	463	HIS	-	expression tag	UNP O43464
A	464	HIS	-	expression tag	UNP O43464

- Molecule 2 is 2-(N-MORPHOLINO)-ETHANESULFONIC ACID (CCD ID: MES) (formula: $C_6H_{13}NO_4S$).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	A	1	Total	C	N	O	S	0	0
			12	6	1	4	1		

- Molecule 3 is SODIUM ION (CCD ID: NA) (formula: Na).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	1	Total	Na	0	0
			1	1		

- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	128	Total	O	0	4
			132	132		

- Molecule 1: Serine protease HTRA2, mitochondrial

HIS	V311	MET
	ALA	
HIS	T322	VAL
HIS	M323	PRO
	K324	SER
	V325	PRO
	T333	PRO
	H343	A141
	ARG	T157
	GLY	Y163
	GLU	I166
	LYS	L167
	ASN	D168
	SER	R169
	SER	E176
	SER	A188
	GLY	I191
	SER	L192
	GLY	N196
	S358	V206
	R359	R209
	R360	Y216
	M385	D224
	M386	P225
	L367	V226
	T368	T229
	L377	L232
	P385	R233
	D386	T236
	V387	Q279
	L414	ARG
	N423	PRO
	Y428	ALA
	R432	ARG
	T433	ASP
	Q434	LEU
	S435	GLY
	T441	LEU
	R442	PRO
	V456	GLN
	T457	E458
	H459	THR
	H460	ASN
	H461	VAL
	H462	T292

4 Data and refinement statistics

Property	Value	Source
Space group	H 3	Depositor
Cell constants a, b, c, α , β , γ	83.69Å 83.69Å 126.96Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	62.95 – 1.75 62.95 – 1.75	Depositor EDS
% Data completeness (in resolution range)	100.0 (62.95-1.75) 100.0 (62.95-1.75)	Depositor EDS
R_{merge}	0.05	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.18 (at 1.75Å)	Xtriage
Refinement program	PHENIX (1.10_2155: ???)	Depositor
R, R_{free}	0.143 , 0.172 0.144 , 0.165	Depositor DCC
R_{free} test set	1706 reflections (5.12%)	wwPDB-VP
Wilson B-factor (Å ²)	23.6	Xtriage
Anisotropy	0.139	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.37 , 36.4	EDS
L-test for twinning ²	$\langle L \rangle = 0.42$, $\langle L^2 \rangle = 0.24$	Xtriage
Estimated twinning fraction	0.199 for h,-h-k,-l	Xtriage
F_o, F_c correlation	0.98	EDS
Total number of atoms	2387	wwPDB-VP
Average B, all atoms (Å ²)	30.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.29% 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

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

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	0.42	0/2301	0.60	0/3139

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

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	2242	0	2255	24	0
2	A	12	0	12	0	0
3	A	1	0	0	0	0
4	A	132	0	0	1	0
All	All	2387	0	2267	24	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 5.

All (24) 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:A:323:MET:HE2	1:A:365:MET:HE2	1.68	0.74
1:A:196[A]:ASN:HD21	1:A:322:THR:HG22	1.56	0.71
1:A:169:ARG:HA	1:A:176:GLU:HG2	1.77	0.66
1:A:358:GLN:HE21	1:A:456:VAL:HG13	1.61	0.65
1:A:434:GLN:OE1	4:A:601:HOH:O	2.15	0.63
1:A:196[A]:ASN:ND2	1:A:322:THR:HG22	2.20	0.56
1:A:325:VAL:HG11	1:A:367:LEU:HD22	1.88	0.55
1:A:157:THR:HG21	1:A:311[A]:VAL:HG11	1.90	0.53
1:A:224:ASP:OD1	1:A:226:VAL:HG13	2.13	0.49
1:A:368:THR:HG23	1:A:423:ASN:HA	1.95	0.49
1:A:414:LEU:HD11	1:A:442:ARG:HG2	1.96	0.47
1:A:322:THR:HG21	1:A:333:ILE:HG12	1.96	0.47
1:A:216:TYR:CE2	1:A:236:THR:HG22	2.51	0.46
1:A:322:THR:CG2	1:A:333:ILE:HG12	2.47	0.45
1:A:323:MET:HE2	1:A:365:MET:CE	2.42	0.45
1:A:385:PRO:C	1:A:387:VAL:H	2.25	0.45
1:A:163:TYR:HB3	1:A:209:ARG:HB3	1.99	0.45
1:A:168:ASP:O	1:A:176:GLU:HA	2.17	0.44
1:A:188:ALA:HB3	1:A:192:LEU:HB3	1.99	0.43
1:A:166:ILE:HG12	1:A:206:VAL:HG12	2.02	0.42
1:A:191:GLY:O	1:A:233:ARG:HA	2.20	0.42
1:A:428:TYR:O	1:A:432:ARG:HG3	2.20	0.41
1:A:360:ARG:NH2	1:A:435:SER:HA	2.35	0.41
1:A:360:ARG:HH22	1:A:435:SER:HA	1.86	0.41

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	294/332 (89%)	289 (98%)	5 (2%)	0	100	100

There are no Ramachandran outliers to report.

5.3.2 Protein sidechains [i](#)

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	243/277 (88%)	236 (97%)	7 (3%)	37 17

All (7) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	226	VAL
1	A	229	ILE
1	A	232	LEU
1	A	324	LYS
1	A	377	LEU
1	A	441	ILE
1	A	458	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (3) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	235	GLN
1	A	358	GLN
1	A	434	GLN

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

Of 2 ligands modelled in this entry, 1 is monoatomic - leaving 1 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	MES	A	501	-	12,12,12	1.78	1 (8%)	14,16,16	1.99	2 (14%)

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	MES	A	501	-	-	1/6/14/14	0/1/1/1

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	501	MES	C8-S	-5.71	1.69	1.77

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	501	MES	C5-N4-C3	4.94	119.94	108.83
2	A	501	MES	C7-N4-C5	3.81	120.98	111.23

There are no chirality outliers.

All (1) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	501	MES	C8-C7-N4-C5

There are no ring outliers.

No monomer is involved in short contacts.

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	293/332 (88%)	-1.10	0 100 100	9, 27, 54, 80	12 (4%)

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](#)

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. 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	RSCC	RSR	B-factors(Å ²)	Q<0.9
2	MES	A	501	12/12	0.99	0.04	21,28,30,31	0
3	NA	A	502	1/1	0.99	0.04	28,28,28,28	0

6.5 Other polymers [i](#)

There are no such residues in this entry.