Solar Ti appendix

Sun · Ti · downloadable appendix

Document	Solar Ti appendix
Subject	Solar photospheric abundance appendix · Ti
Author	Ryan Schmitt
Date	2026-11-15
Publisher	The Exoplanet Codex · exoplanetcodex.org
Version	feed v1.685
Source	science commit 48db0c21bf3d
Web	https://exoplanetcodex.org/systems/sol/elements/ti/

Solar titanium: 4.961 ± 0.066

Asplund, Amarsi & Grevesse 2021: 4.97 ± 0.05 · this measurement -0.009 dex

Asplund, Amarsi & Grevesse (2021) give no line recipe we can repeat for this element, so this is our best HARPS product: the Reference Grade analysis with the most complete treatment, then the most lines.

VIS: 4.961 ± 0.066 · HARPS · VIS · Ti I · reference lines · <3D> LTE (Gerber)

Highlighted Products

near-UV

5.106 ± 0.047

Ti II · reference lines · <3D> LTE (Gerber) · Kitt Peak (1984, molecfit) · Reference Grade

VIS

4.961 ± 0.066

Ti I · reference lines · <3D> LTE (Gerber) · HARPS · Reference Grade

red-optical

5.113 ± 0.094

Ti I · reference lines · <3D> NLTE (Gerber) · Kitt Peak (Kurucz 2005) · Reference Grade

NIR

5.053 ± 0.092

Ti I · reference lines · <3D> NLTE (Gerber) · Kitt Peak (1984, molecfit) · Reference Grade

H

4.864 ± 0.122

Ti I · reference lines · <3D> NLTE (Gerber) · CRIRES+ H (full arm, telluric-corrected) · Reference Grade

K

4.932 ± 0.157

Ti I · reference lines · <3D> NLTE (Gerber) · CRIRES+ · Reference Grade

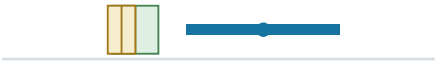
Line grades

Every product is measured on one of three grades of spectral lines and the grades are never mixed in one number.

Grade	What it means	This element
Reference Grade	lines from a published solar line set (Asplund et al. 2021 and similar), measured with the oscillator strengths the authors used	198 products -- Ti I · Asplund et al. 2021 lines; Ti I · reference lines; Ti II · Asplund et al. 2021 lines; Ti II · reference lines
Codex Grade	lines chosen by the Codex whose oscillator strength carries a published uncertainty (laboratory measurement, NIST accuracy class A-C, or the paper's own stated error), between 5% and 60% deep	144 products -- Ti I · Codex-graded lines; Ti II · Codex-graded lines
Deep Grade	the same oscillator-strength rule on lines deeper than 60% -- stronger lines, more sensitive to damping and the model atmosphere	none for the Sun: every line in this grade is excluded as saturated or an outlier (see Excluded lines)

Error-bar Forest Plot

near-UV — Kitt Peak (Kurucz 2005)
A(Ti) dex; axis 4.68–5.62

Ti II · Codex-graded lines · 1D LTE Codex Grade · 5 lines		5.082 ±0.122
Ti II · Codex-graded lines · 1D NLTE (Amarsi) Codex Grade · 5 lines		5.082 ±0.123
Ti II · Codex-graded lines · 1D NLTE (Gerber) Codex Grade · 4 lines		5.118 ±0.111
Ti II · Codex-graded lines · 1D LTE (Gerber) Codex Grade · 5 lines		5.067 ±0.119
Ti II · Codex-graded lines · <3D> LTE (Gerber) Codex Grade · 6 lines · EXPERIMENTAL-NOT-ADOPTED		5.107 ±0.101
Ti II · Codex-graded lines · <3D> NLTE (Gerber) Codex Grade · 6 lines · EXPERIMENTAL-NOT-ADOPTED		5.202 ±0.113
Ti II · reference lines · 1D LTE Reference Grade · 153 lines		5.183 ±0.048
Ti II · reference lines · 1D NLTE (Amarsi) Reference Grade · 147 lines		5.184 ±0.049
Ti II · reference lines · 1D NLTE (Gerber) Reference Grade · 96 lines		5.101 ±0.041
Ti II · reference lines · 1D LTE (Gerber) Reference Grade · 153 lines		5.203 ±0.048
Ti II · reference lines · <3D> LTE (Gerber) Reference Grade · 154 lines · EXPERIMENTAL-NOT-ADOPTED		5.361 ±0.048
Ti II · reference lines · <3D> NLTE (Gerber) Reference Grade · 135 lines · EXPERIMENTAL-NOT-ADOPTED		5.289 ±0.043
Ti I · Codex-graded lines · 1D LTE Codex Grade · 15 lines		5.206 ±0.168
Ti I · Codex-graded lines · 1D NLTE (Amarsi) Codex Grade · 15 lines		5.248 ±0.167
Ti I · Codex-graded lines · 1D NLTE (Gerber) Codex Grade · 8 lines		5.140 ±0.142
Ti I · Codex-graded lines · 1D LTE (Gerber) Codex Grade · 14 lines		5.204 ±0.151
Ti I · Codex-graded lines · <3D> LTE (Gerber) Codex Grade · 14 lines · EXPERIMENTAL-NOT-ADOPTED		5.348 ±0.145

near-UV — Kitt Peak (Kurucz 2005)
A(Ti) dex; axis 4.68–5.62

Ti I · Codex-graded lines · <3D> NLTE (Gerber) Codex Grade · 12 lines · EXPERIMENTAL-NOT-ADOPTED		5.455 ±0.123
Ti I · reference lines · 1D LTE Reference Grade · 34 lines		5.293 ±0.104
Ti I · reference lines · 1D NLTE (Amarsi) Reference Grade · 34 lines		5.318 ±0.104
Ti I · reference lines · 1D NLTE (Gerber) Reference Grade · 15 lines		5.067 ±0.084
Ti I · reference lines · 1D LTE (Gerber) Reference Grade · 33 lines		5.303 ±0.101
Ti I · reference lines · <3D> LTE (Gerber) Reference Grade · 31 lines · EXPERIMENTAL-NOT-ADOPTED		5.459 ±0.108
Ti I · reference lines · <3D> NLTE (Gerber) Reference Grade · 26 lines · EXPERIMENTAL-NOT-ADOPTED		5.506 ±0.084

near-UV — Kitt Peak (1984, molecfit)
A(Ti) dex; axis 4.68–5.62

Ti II · Codex-graded lines · 1D LTE Codex Grade · 5 lines		4.845 ±0.125
Ti II · Codex-graded lines · 1D NLTE (Amarsi) Codex Grade · 5 lines		4.836 ±0.125
Ti II · Codex-graded lines · 1D NLTE (Gerber) Codex Grade · 5 lines		4.948 ±0.141
Ti II · Codex-graded lines · 1D LTE (Gerber) Codex Grade · 5 lines		4.854 ±0.117
Ti II · Codex-graded lines · <3D> LTE (Gerber) Codex Grade · 5 lines · EXPERIMENTAL-NOT-ADOPTED		4.946 ±0.106
Ti II · Codex-graded lines · <3D> NLTE (Gerber) Codex Grade · 5 lines · EXPERIMENTAL-NOT-ADOPTED		5.035 ±0.124
Ti II · reference lines · 1D LTE Reference Grade · 153 lines		5.003 ±0.046
Ti II · reference lines · 1D NLTE (Amarsi) Reference Grade · 147 lines		5.012 ±0.047
Ti II · reference lines · 1D NLTE (Gerber) Reference Grade · 121 lines		4.965 ±0.040
Ti II · reference lines · 1D LTE (Gerber) Reference Grade · 154 lines		5.016 ±0.047

near-UV — Kitt Peak (1984, molecfit)
A(Ti) dex; axis 4.68–5.62

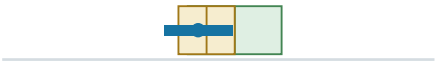
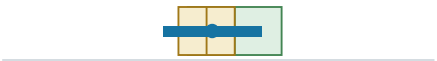
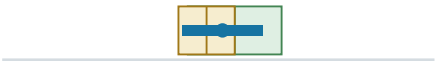
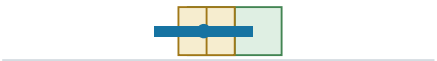
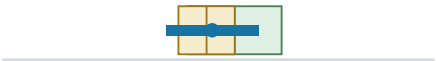
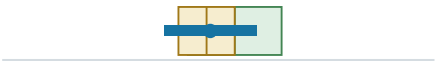
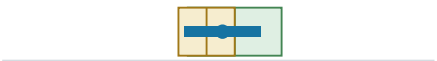
Ti II · reference lines · <3D> LTE (Gerber) Reference Grade · 156 lines · EXPERIMENTAL-NOT-ADOPTED		5.106 ±0.047
Ti II · reference lines · <3D> NLTE (Gerber) Reference Grade · 142 lines · EXPERIMENTAL-NOT-ADOPTED		5.114 ±0.043
Ti I · Codex-graded lines · 1D LTE Codex Grade · 12 lines		5.047 ±0.129
Ti I · Codex-graded lines · 1D NLTE (Amarsi) Codex Grade · 12 lines		5.091 ±0.129
Ti I · Codex-graded lines · 1D NLTE (Gerber) Codex Grade · 10 lines		5.067 ±0.136
Ti I · Codex-graded lines · 1D LTE (Gerber) Codex Grade · 12 lines		5.055 ±0.130
Ti I · Codex-graded lines · <3D> LTE (Gerber) Codex Grade · 14 lines · EXPERIMENTAL-NOT-ADOPTED		5.186 ±0.141
Ti I · Codex-graded lines · <3D> NLTE (Gerber) Codex Grade · 13 lines · EXPERIMENTAL-NOT-ADOPTED		5.233 ±0.130
Ti I · reference lines · 1D LTE Reference Grade · 36 lines		4.963 ±0.092
Ti I · reference lines · 1D NLTE (Amarsi) Reference Grade · 36 lines		4.988 ±0.092
Ti I · reference lines · 1D NLTE (Gerber) Reference Grade · 28 lines		5.074 ±0.074
Ti I · reference lines · 1D LTE (Gerber) Reference Grade · 34 lines		5.006 ±0.076
Ti I · reference lines · <3D> LTE (Gerber) Reference Grade · 35 lines · EXPERIMENTAL-NOT-ADOPTED		5.164 ±0.084
Ti I · reference lines · <3D> NLTE (Gerber) Reference Grade · 35 lines · EXPERIMENTAL-NOT-ADOPTED		5.280 ±0.080

near-UV axis: 4.68 · 4.92 · 5.15 · 5.38 · 5.62 A(Ti) dex

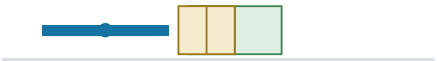
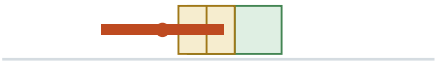
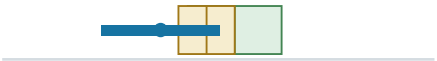
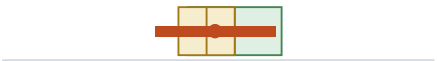
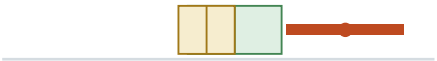
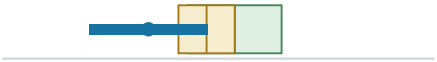
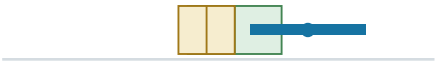
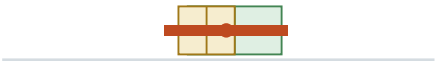
VIS — HARPS
A(Ti) dex; axis 4.72–5.18

Ti II · Asplund et al. 2021 lines · 1D LTE Reference Grade · 13 lines		4.939 ±0.037
Ti II · Asplund et al. 2021 lines · 1D NLTE (Amarsi) Reference Grade · 13 lines		4.938 ±0.037

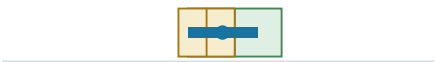
VIS — HARPS
A(Ti) dex; axis 4.72–5.18

Ti II · Asplund et al. 2021 lines · 1D NLTE (Gerber) Reference Grade · 13 lines		4.956 ±0.037
Ti II · Asplund et al. 2021 lines · 1D LTE (Gerber) Reference Grade · 13 lines		4.931 ±0.036
Ti II · Asplund et al. 2021 lines · <3D> LTE (Gerber) Reference Grade · 13 lines · EXPERIMENTAL-NOT-ADOPTED		4.993 ±0.038
Ti II · Asplund et al. 2021 lines · <3D> NLTE (Gerber) Reference Grade · 13 lines · EXPERIMENTAL-NOT-ADOPTED		5.007 ±0.037
Ti II · Codex-graded lines · 1D LTE Codex Grade · 49 lines		4.946 ±0.053
Ti II · Codex-graded lines · 1D NLTE (Amarsi) Codex Grade · 49 lines		4.944 ±0.053
Ti II · Codex-graded lines · 1D NLTE (Gerber) Codex Grade · 46 lines		4.957 ±0.043
Ti II · Codex-graded lines · 1D LTE (Gerber) Codex Grade · 49 lines		4.937 ±0.053
Ti II · Codex-graded lines · <3D> LTE (Gerber) Codex Grade · 48 lines · EXPERIMENTAL-NOT-ADOPTED		4.998 ±0.046
Ti II · Codex-graded lines · <3D> NLTE (Gerber) Codex Grade · 48 lines · EXPERIMENTAL-NOT-ADOPTED		5.021 ±0.047
Ti II · reference lines · 1D LTE Reference Grade · 72 lines		4.946 ±0.049
Ti II · reference lines · 1D NLTE (Amarsi) Reference Grade · 72 lines		4.944 ±0.049
Ti II · reference lines · 1D NLTE (Gerber) Reference Grade · 69 lines		4.957 ±0.041
Ti II · reference lines · 1D LTE (Gerber) Reference Grade · 72 lines		4.938 ±0.049
Ti II · reference lines · <3D> LTE (Gerber) Reference Grade · 72 lines · EXPERIMENTAL-NOT-ADOPTED		4.999 ±0.043
Ti II · reference lines · <3D> NLTE (Gerber) Reference Grade · 71 lines · EXPERIMENTAL-NOT-ADOPTED		5.025 ±0.043
Ti I · Asplund et al. 2021 lines · 1D LTE Reference Grade · 27 lines		4.819 ±0.067
Ti I · Asplund et al. 2021 lines · 1D NLTE (Amarsi) Reference Grade · 26 lines		4.845 ±0.068

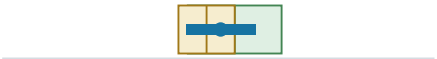
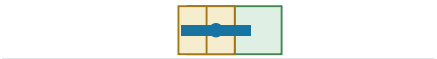
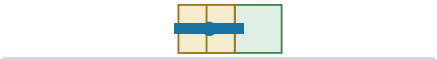
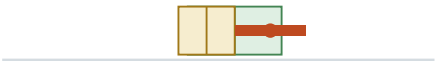
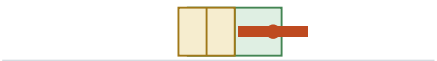
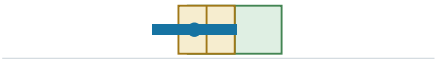
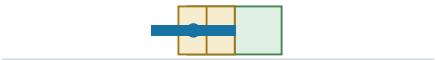
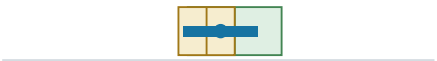
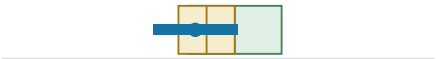
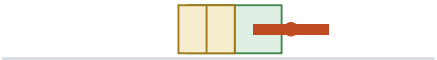
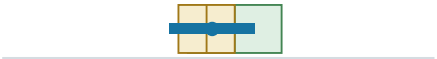
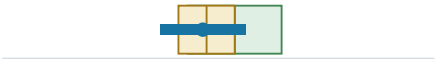
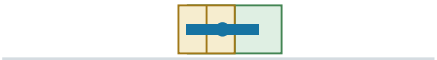
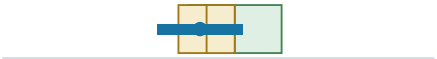
VIS — HARPS
A(Ti) dex; axis 4.72–5.18

Ti I · Asplund et al. 2021 lines · 1D NLTE (Gerber) Reference Grade · 27 lines		5.027 ±0.065
Ti I · Asplund et al. 2021 lines · 1D LTE (Gerber) Reference Grade · 27 lines		4.832 ±0.067
Ti I · Asplund et al. 2021 lines · <3D> LTE (Gerber) Reference Grade · 27 lines · EXPERIMENTAL-NOT-ADOPTED		4.893 ±0.065
Ti I · Asplund et al. 2021 lines · <3D> NLTE (Gerber) Reference Grade · 27 lines · EXPERIMENTAL-NOT-ADOPTED		5.053 ±0.063
Ti I · Codex-graded lines · 1D LTE Codex Grade · 100 lines		4.862 ±0.064
Ti I · Codex-graded lines · 1D NLTE (Amarsi) Codex Grade · 98 lines		4.891 ±0.063
Ti I · Codex-graded lines · 1D NLTE (Gerber) Codex Grade · 91 lines		5.055 ±0.062
Ti I · Codex-graded lines · 1D LTE (Gerber) Codex Grade · 99 lines		4.873 ±0.063
Ti I · Codex-graded lines · <3D> LTE (Gerber) Codex Grade · 105 lines · EXPERIMENTAL-NOT-ADOPTED		4.949 ±0.064
Ti I · Codex-graded lines · <3D> NLTE (Gerber) Codex Grade · 100 lines · EXPERIMENTAL-NOT-ADOPTED		5.088 ±0.063
Ti I · reference lines · 1D LTE Reference Grade · 78 lines		4.864 ±0.063
Ti I · reference lines · 1D NLTE (Amarsi) Reference Grade · 78 lines		4.878 ±0.063
Ti I · reference lines · 1D NLTE (Gerber) Reference Grade · 74 lines		5.048 ±0.062
Ti I · reference lines · 1D LTE (Gerber) Reference Grade · 78 lines		4.880 ±0.063
Ti I · reference lines · <3D> LTE (Gerber) Reference Grade · 81 lines · EXPERIMENTAL-NOT-ADOPTED		4.961 ±0.066
Ti I · reference lines · <3D> NLTE (Gerber) Reference Grade · 78 lines · EXPERIMENTAL-NOT-ADOPTED		5.076 ±0.063

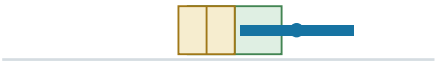
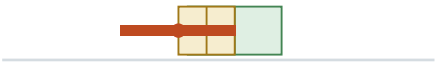
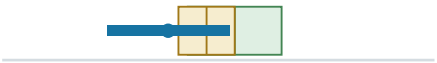
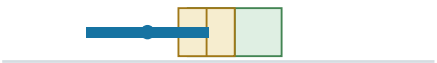
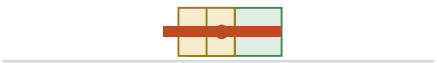
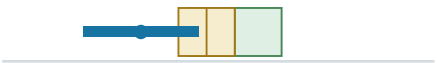
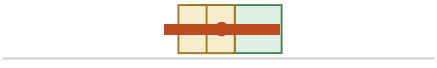
VIS — Kitt Peak (Kurucz 2005)
A(Ti) dex; axis 4.72–5.18

Ti II · Asplund et al. 2021 lines · 1D LTE Reference Grade · 14 lines		4.957 ±0.037

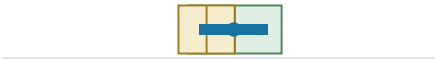
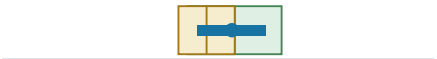
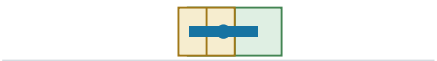
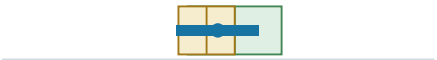
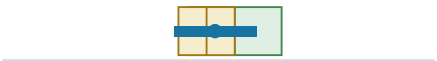
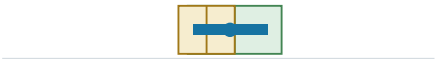
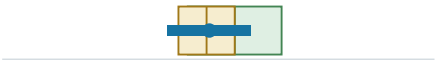
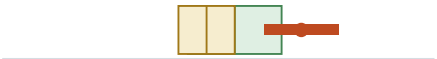
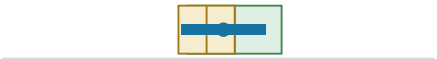
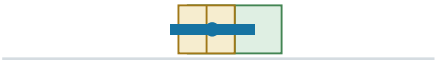
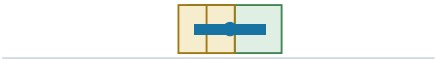
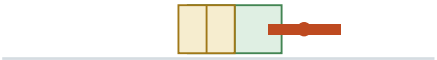
VIS — Kitt Peak (Kurucz 2005)
A(Ti) dex; axis 4.72–5.18

Ti II · Asplund et al. 2021 lines · 1D NLTE (Amarsi) Reference Grade · 14 lines		4.955 ±0.037
Ti II · Asplund et al. 2021 lines · 1D NLTE (Gerber) Reference Grade · 14 lines		4.950 ±0.037
Ti II · Asplund et al. 2021 lines · 1D LTE (Gerber) Reference Grade · 14 lines		4.943 ±0.037
Ti II · Asplund et al. 2021 lines · <3D> LTE (Gerber) Reference Grade · 14 lines · EXPERIMENTAL-NOT-ADOPTED		5.008 ±0.037
Ti II · Asplund et al. 2021 lines · <3D> NLTE (Gerber) Reference Grade · 14 lines · EXPERIMENTAL-NOT-ADOPTED		5.011 ±0.037
Ti II · Codex-graded lines · 1D LTE Codex Grade · 49 lines		4.927 ±0.045
Ti II · Codex-graded lines · 1D NLTE (Amarsi) Codex Grade · 49 lines		4.926 ±0.045
Ti II · Codex-graded lines · 1D NLTE (Gerber) Codex Grade · 48 lines		4.955 ±0.040
Ti II · Codex-graded lines · 1D LTE (Gerber) Codex Grade · 49 lines		4.928 ±0.045
Ti II · Codex-graded lines · <3D> LTE (Gerber) Codex Grade · 48 lines · EXPERIMENTAL-NOT-ADOPTED		4.998 ±0.040
Ti II · Codex-graded lines · <3D> NLTE (Gerber) Codex Grade · 48 lines · EXPERIMENTAL-NOT-ADOPTED		5.030 ±0.040
Ti II · reference lines · 1D LTE Reference Grade · 73 lines		4.946 ±0.046
Ti II · reference lines · 1D NLTE (Amarsi) Reference Grade · 73 lines		4.936 ±0.046
Ti II · reference lines · 1D NLTE (Gerber) Reference Grade · 71 lines		4.957 ±0.038
Ti II · reference lines · 1D LTE (Gerber) Reference Grade · 73 lines		4.933 ±0.046
Ti II · reference lines · <3D> LTE (Gerber) Reference Grade · 73 lines · EXPERIMENTAL-NOT-ADOPTED		5.008 ±0.039
Ti II · reference lines · <3D> NLTE (Gerber) Reference Grade · 72 lines · EXPERIMENTAL-NOT-ADOPTED		5.037 ±0.039
Ti I · Asplund et al. 2021 lines · 1D LTE Reference Grade · 27 lines		4.839 ±0.062

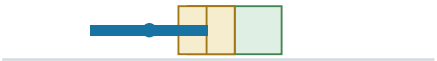
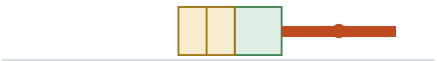
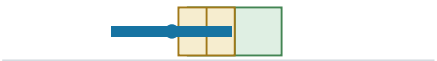
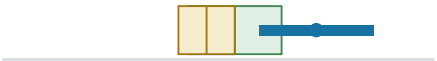
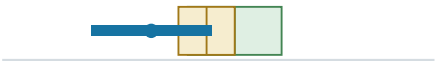
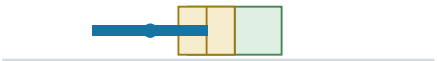
VIS — Kitt Peak (Kurucz 2005)
A(Ti) dex; axis 4.72–5.18

Ti I · Asplund et al. 2021 lines · 1D NLTE (Amarsi) Reference Grade · 26 lines		4.869 ±0.063
Ti I · Asplund et al. 2021 lines · 1D NLTE (Gerber) Reference Grade · 27 lines		5.036 ±0.061
Ti I · Asplund et al. 2021 lines · 1D LTE (Gerber) Reference Grade · 27 lines		4.851 ±0.062
Ti I · Asplund et al. 2021 lines · <3D> LTE (Gerber) Reference Grade · 27 lines · EXPERIMENTAL-NOT-ADOPTED		4.910 ±0.062
Ti I · Asplund et al. 2021 lines · <3D> NLTE (Gerber) Reference Grade · 27 lines · EXPERIMENTAL-NOT-ADOPTED		5.074 ±0.060
Ti I · Codex-graded lines · 1D LTE Codex Grade · 104 lines		4.865 ±0.065
Ti I · Codex-graded lines · 1D NLTE (Amarsi) Codex Grade · 102 lines		4.899 ±0.065
Ti I · Codex-graded lines · 1D NLTE (Gerber) Codex Grade · 97 lines		5.055 ±0.061
Ti I · Codex-graded lines · 1D LTE (Gerber) Codex Grade · 104 lines		4.877 ±0.065
Ti I · Codex-graded lines · <3D> LTE (Gerber) Codex Grade · 106 lines · EXPERIMENTAL-NOT-ADOPTED		4.956 ±0.063
Ti I · Codex-graded lines · <3D> NLTE (Gerber) Codex Grade · 102 lines · EXPERIMENTAL-NOT-ADOPTED		5.091 ±0.062
Ti I · reference lines · 1D LTE Reference Grade · 78 lines		4.861 ±0.062
Ti I · reference lines · 1D NLTE (Amarsi) Reference Grade · 78 lines		4.870 ±0.062
Ti I · reference lines · 1D NLTE (Gerber) Reference Grade · 76 lines		5.045 ±0.061
Ti I · reference lines · 1D LTE (Gerber) Reference Grade · 78 lines		4.874 ±0.062
Ti I · reference lines · <3D> LTE (Gerber) Reference Grade · 80 lines · EXPERIMENTAL-NOT-ADOPTED		4.956 ±0.062
Ti I · reference lines · <3D> NLTE (Gerber) Reference Grade · 78 lines · EXPERIMENTAL-NOT-ADOPTED		5.074 ±0.061

VIS — Kitt Peak (1984, molecfit)
A(Ti) dex; axis 4.72–5.18

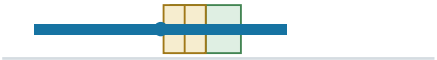
Ti II · Asplund et al. 2021 lines · 1D LTE Reference Grade · 14 lines		4.969 ±0.037
Ti II · Asplund et al. 2021 lines · 1D NLTE (Amarsi) Reference Grade · 14 lines		4.967 ±0.037
Ti II · Asplund et al. 2021 lines · 1D NLTE (Gerber) Reference Grade · 14 lines		4.969 ±0.036
Ti II · Asplund et al. 2021 lines · 1D LTE (Gerber) Reference Grade · 14 lines		4.958 ±0.036
Ti II · Asplund et al. 2021 lines · <3D> LTE (Gerber) Reference Grade · 14 lines · EXPERIMENTAL-NOT-ADOPTED		5.024 ±0.037
Ti II · Asplund et al. 2021 lines · <3D> NLTE (Gerber) Reference Grade · 14 lines · EXPERIMENTAL-NOT-ADOPTED		5.031 ±0.036
Ti II · Codex-graded lines · 1D LTE Codex Grade · 49 lines		4.952 ±0.044
Ti II · Codex-graded lines · 1D NLTE (Amarsi) Codex Grade · 49 lines		4.949 ±0.044
Ti II · Codex-graded lines · 1D NLTE (Gerber) Codex Grade · 48 lines		4.965 ±0.040
Ti II · Codex-graded lines · 1D LTE (Gerber) Codex Grade · 49 lines		4.943 ±0.044
Ti II · Codex-graded lines · <3D> LTE (Gerber) Codex Grade · 48 lines · EXPERIMENTAL-NOT-ADOPTED		5.002 ±0.040
Ti II · Codex-graded lines · <3D> NLTE (Gerber) Codex Grade · 48 lines · EXPERIMENTAL-NOT-ADOPTED		5.041 ±0.040
Ti II · reference lines · 1D LTE Reference Grade · 73 lines		4.958 ±0.045
Ti II · reference lines · 1D NLTE (Amarsi) Reference Grade · 73 lines		4.946 ±0.045
Ti II · reference lines · 1D NLTE (Gerber) Reference Grade · 71 lines		4.965 ±0.038
Ti II · reference lines · 1D LTE (Gerber) Reference Grade · 73 lines		4.948 ±0.045
Ti II · reference lines · <3D> LTE (Gerber) Reference Grade · 73 lines · EXPERIMENTAL-NOT-ADOPTED		5.018 ±0.039
Ti II · reference lines · <3D> NLTE (Gerber) Reference Grade · 72 lines · EXPERIMENTAL-NOT-ADOPTED		5.044 ±0.038

VIS — Kitt Peak (1984, molecfit)
A(Ti) dex; axis 4.72–5.18

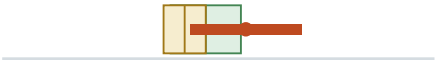
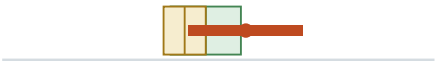
Ti I · Asplund et al. 2021 lines · 1D LTE Reference Grade · 27 lines		4.851 ±0.062
Ti I · Asplund et al. 2021 lines · 1D NLTE (Amarsi) Reference Grade · 26 lines		4.879 ±0.062
Ti I · Asplund et al. 2021 lines · 1D NLTE (Gerber) Reference Grade · 27 lines		5.062 ±0.061
Ti I · Asplund et al. 2021 lines · 1D LTE (Gerber) Reference Grade · 27 lines		4.865 ±0.062
Ti I · Asplund et al. 2021 lines · <3D> LTE (Gerber) Reference Grade · 27 lines · EXPERIMENTAL-NOT-ADOPTED		4.921 ±0.062
Ti I · Asplund et al. 2021 lines · <3D> NLTE (Gerber) Reference Grade · 27 lines · EXPERIMENTAL-NOT-ADOPTED		5.081 ±0.060
Ti I · Codex-graded lines · 1D LTE Codex Grade · 102 lines		4.870 ±0.064
Ti I · Codex-graded lines · 1D NLTE (Amarsi) Codex Grade · 100 lines		4.903 ±0.064
Ti I · Codex-graded lines · 1D NLTE (Gerber) Codex Grade · 96 lines		5.057 ±0.061
Ti I · Codex-graded lines · 1D LTE (Gerber) Codex Grade · 102 lines		4.881 ±0.064
Ti I · Codex-graded lines · <3D> LTE (Gerber) Codex Grade · 105 lines · EXPERIMENTAL-NOT-ADOPTED		4.960 ±0.063
Ti I · Codex-graded lines · <3D> NLTE (Gerber) Codex Grade · 102 lines · EXPERIMENTAL-NOT-ADOPTED		5.088 ±0.063
Ti I · reference lines · 1D LTE Reference Grade · 78 lines		4.869 ±0.061
Ti I · reference lines · 1D NLTE (Amarsi) Reference Grade · 78 lines		4.880 ±0.061
Ti I · reference lines · 1D NLTE (Gerber) Reference Grade · 75 lines		5.055 ±0.061
Ti I · reference lines · 1D LTE (Gerber) Reference Grade · 78 lines		4.881 ±0.061
Ti I · reference lines · <3D> LTE (Gerber) Reference Grade · 80 lines · EXPERIMENTAL-NOT-ADOPTED		4.969 ±0.062
Ti I · reference lines · <3D> NLTE (Gerber) Reference Grade · 79 lines · EXPERIMENTAL-NOT-ADOPTED		5.085 ±0.064

VIS axis: 4.72 · 4.84 · 4.95 · 5.07 · 5.18 A(Ti) dex

red-optical — IAG FTS
A(Ti) dex; axis 4.68–5.30

Ti II · Codex-graded lines · 1D LTE Codex Grade · 6 lines		5.018 ±0.124
Ti II · Codex-graded lines · 1D NLTE (Amarsi) Codex Grade · 6 lines		5.016 ±0.126
Ti II · Codex-graded lines · 1D NLTE (Gerber) Codex Grade · 5 lines		4.958 ±0.091
Ti II · Codex-graded lines · 1D LTE (Gerber) Codex Grade · 6 lines		5.006 ±0.121
Ti II · Codex-graded lines · <3D> LTE (Gerber) Codex Grade · 6 lines · EXPERIMENTAL-NOT-ADOPTED		5.053 ±0.137
Ti II · Codex-graded lines · <3D> NLTE (Gerber) Codex Grade · 6 lines · EXPERIMENTAL-NOT-ADOPTED		5.048 ±0.131
Ti II · reference lines · 1D LTE Reference Grade · 6 lines		5.018 ±0.124
Ti II · reference lines · 1D NLTE (Amarsi) Reference Grade · 6 lines		5.016 ±0.126
Ti II · reference lines · 1D NLTE (Gerber) Reference Grade · 5 lines		4.958 ±0.091
Ti II · reference lines · 1D LTE (Gerber) Reference Grade · 6 lines		5.006 ±0.121
Ti II · reference lines · <3D> LTE (Gerber) Reference Grade · 6 lines · EXPERIMENTAL-NOT-ADOPTED		5.053 ±0.137
Ti II · reference lines · <3D> NLTE (Gerber) Reference Grade · 6 lines · EXPERIMENTAL-NOT-ADOPTED		5.048 ±0.131
Ti I · Asplund et al. 2021 lines · 1D LTE Reference Grade · 7 lines		4.894 ±0.180
Ti I · Asplund et al. 2021 lines · 1D NLTE (Amarsi) Reference Grade · 7 lines		4.919 ±0.173
Ti I · Asplund et al. 2021 lines · 1D NLTE (Gerber) Reference Grade · 7 lines		5.109 ±0.156
Ti I · Asplund et al. 2021 lines · 1D LTE (Gerber) Reference Grade · 7 lines		4.906 ±0.180
Ti I · Asplund et al. 2021 lines · <3D> LTE (Gerber) Reference Grade · 7 lines · EXPERIMENTAL-NOT-ADOPTED		4.976 ±0.154
Ti I · Asplund et al. 2021 lines · <3D> NLTE (Gerber) Reference Grade · 7 lines · EXPERIMENTAL-NOT-ADOPTED		5.126 ±0.132

red-optical — IAG FTS
A(Ti) dex; axis 4.68–5.30

Ti I · Codex-graded lines · 1D LTE Codex Grade · 30 lines		4.918 ±0.082
Ti I · Codex-graded lines · 1D NLTE (Amarsi) Codex Grade · 29 lines		4.922 ±0.083
Ti I · Codex-graded lines · 1D NLTE (Gerber) Codex Grade · 28 lines		5.094 ±0.077
Ti I · Codex-graded lines · 1D LTE (Gerber) Codex Grade · 30 lines		4.931 ±0.082
Ti I · Codex-graded lines · <3D> LTE (Gerber) Codex Grade · 30 lines · EXPERIMENTAL-NOT-ADOPTED		5.027 ±0.080
Ti I · Codex-graded lines · <3D> NLTE (Gerber) Codex Grade · 30 lines · EXPERIMENTAL-NOT-ADOPTED		5.133 ±0.077
Ti I · reference lines · 1D LTE Reference Grade · 28 lines		4.918 ±0.084
Ti I · reference lines · 1D NLTE (Amarsi) Reference Grade · 27 lines		4.922 ±0.085
Ti I · reference lines · 1D NLTE (Gerber) Reference Grade · 26 lines		5.094 ±0.079
Ti I · reference lines · 1D LTE (Gerber) Reference Grade · 28 lines		4.931 ±0.084
Ti I · reference lines · <3D> LTE (Gerber) Reference Grade · 28 lines · EXPERIMENTAL-NOT-ADOPTED		5.027 ±0.081
Ti I · reference lines · <3D> NLTE (Gerber) Reference Grade · 28 lines · EXPERIMENTAL-NOT-ADOPTED		5.133 ±0.079

red-optical — Kitt Peak (Kurucz 2005)
A(Ti) dex; axis 4.68–5.30

Ti II · Codex-graded lines · 1D LTE Codex Grade · 6 lines		5.025 ±0.113
Ti II · Codex-graded lines · 1D NLTE (Amarsi) Codex Grade · 6 lines		5.023 ±0.114
Ti II · Codex-graded lines · 1D NLTE (Gerber) Codex Grade · 5 lines		4.958 ±0.085
Ti II · Codex-graded lines · 1D LTE (Gerber) Codex Grade · 6 lines		5.013 ±0.109
Ti II · Codex-graded lines · <3D> LTE (Gerber) Codex Grade · 6 lines · EXPERIMENTAL-NOT-ADOPTED		5.059 ±0.125

red-optical — Kitt Peak (Kurucz 2005)
A(Ti) dex; axis 4.68–5.30

Ti II · Codex-graded lines · <3D> NLTE (Gerber) Codex Grade · 6 lines · EXPERIMENTAL-NOT-ADOPTED		5.059 ±0.121
Ti II · reference lines · 1D LTE Reference Grade · 6 lines		5.025 ±0.113
Ti II · reference lines · 1D NLTE (Amarsi) Reference Grade · 6 lines		5.023 ±0.114
Ti II · reference lines · 1D NLTE (Gerber) Reference Grade · 5 lines		4.958 ±0.085
Ti II · reference lines · 1D LTE (Gerber) Reference Grade · 6 lines		5.013 ±0.109
Ti II · reference lines · <3D> LTE (Gerber) Reference Grade · 6 lines · EXPERIMENTAL-NOT-ADOPTED		5.059 ±0.125
Ti II · reference lines · <3D> NLTE (Gerber) Reference Grade · 6 lines · EXPERIMENTAL-NOT-ADOPTED		5.059 ±0.121
Ti I · Asplund et al. 2021 lines · 1D LTE Reference Grade · 7 lines		4.879 ±0.169
Ti I · Asplund et al. 2021 lines · 1D NLTE (Amarsi) Reference Grade · 7 lines		4.904 ±0.162
Ti I · Asplund et al. 2021 lines · 1D NLTE (Gerber) Reference Grade · 7 lines		5.080 ±0.139
Ti I · Asplund et al. 2021 lines · 1D LTE (Gerber) Reference Grade · 7 lines		4.892 ±0.165
Ti I · Asplund et al. 2021 lines · <3D> LTE (Gerber) Reference Grade · 7 lines · EXPERIMENTAL-NOT-ADOPTED		4.962 ±0.145
Ti I · Asplund et al. 2021 lines · <3D> NLTE (Gerber) Reference Grade · 7 lines · EXPERIMENTAL-NOT-ADOPTED		5.108 ±0.126
Ti I · Codex-graded lines · 1D LTE Codex Grade · 31 lines		4.917 ±0.086
Ti I · Codex-graded lines · 1D NLTE (Amarsi) Codex Grade · 30 lines		4.909 ±0.087
Ti I · Codex-graded lines · 1D NLTE (Gerber) Codex Grade · 29 lines		5.072 ±0.081
Ti I · Codex-graded lines · 1D LTE (Gerber) Codex Grade · 31 lines		4.929 ±0.084
Ti I · Codex-graded lines · <3D> LTE (Gerber) Codex Grade · 32 lines · EXPERIMENTAL-NOT-ADOPTED		5.012 ±0.092

red-optical — Kitt Peak (Kurucz 2005)
A(Ti) dex; axis 4.68–5.30

Ti I · Codex-graded lines · <3D> NLTE (Gerber) Codex Grade · 32 lines · EXPERIMENTAL-NOT-ADOPTED		5.120 ±0.090
Ti I · reference lines · 1D LTE Reference Grade · 29 lines		4.915 ±0.089
Ti I · reference lines · 1D NLTE (Amarsi) Reference Grade · 28 lines		4.907 ±0.090
Ti I · reference lines · 1D NLTE (Gerber) Reference Grade · 27 lines		5.071 ±0.083
Ti I · reference lines · 1D LTE (Gerber) Reference Grade · 29 lines		4.927 ±0.087
Ti I · reference lines · <3D> LTE (Gerber) Reference Grade · 30 lines · EXPERIMENTAL-NOT-ADOPTED		5.012 ±0.095
Ti I · reference lines · <3D> NLTE (Gerber) Reference Grade · 30 lines · EXPERIMENTAL-NOT-ADOPTED		5.113 ±0.094

red-optical — Kitt Peak (1984, molecfit)
A(Ti) dex; axis 4.68–5.30

Ti II · Codex-graded lines · 1D LTE Codex Grade · 6 lines		5.034 ±0.117
Ti II · Codex-graded lines · 1D NLTE (Amarsi) Codex Grade · 6 lines		5.032 ±0.118
Ti II · Codex-graded lines · 1D NLTE (Gerber) Codex Grade · 5 lines		4.986 ±0.089
Ti II · Codex-graded lines · 1D LTE (Gerber) Codex Grade · 6 lines		5.023 ±0.114
Ti II · Codex-graded lines · <3D> LTE (Gerber) Codex Grade · 6 lines · EXPERIMENTAL-NOT-ADOPTED		5.069 ±0.128
Ti II · Codex-graded lines · <3D> NLTE (Gerber) Codex Grade · 6 lines · EXPERIMENTAL-NOT-ADOPTED		5.069 ±0.124
Ti II · reference lines · 1D LTE Reference Grade · 6 lines		5.034 ±0.117
Ti II · reference lines · 1D NLTE (Amarsi) Reference Grade · 6 lines		5.032 ±0.118
Ti II · reference lines · 1D NLTE (Gerber) Reference Grade · 5 lines		4.986 ±0.089
Ti II · reference lines · 1D LTE (Gerber) Reference Grade · 6 lines		5.023 ±0.114

red-optical — Kitt Peak (1984, molecfit)
A(Ti) dex; axis 4.68–5.30

Ti II · reference lines · <3D> LTE (Gerber) Reference Grade · 6 lines · EXPERIMENTAL-NOT-ADOPTED		5.069 ±0.128
Ti II · reference lines · <3D> NLTE (Gerber) Reference Grade · 6 lines · EXPERIMENTAL-NOT-ADOPTED		5.069 ±0.124
Ti I · Asplund et al. 2021 lines · 1D LTE Reference Grade · 7 lines		4.888 ±0.154
Ti I · Asplund et al. 2021 lines · 1D NLTE (Amarsi) Reference Grade · 7 lines		4.913 ±0.148
Ti I · Asplund et al. 2021 lines · 1D NLTE (Gerber) Reference Grade · 7 lines		5.111 ±0.130
Ti I · Asplund et al. 2021 lines · 1D LTE (Gerber) Reference Grade · 7 lines		4.900 ±0.152
Ti I · Asplund et al. 2021 lines · <3D> LTE (Gerber) Reference Grade · 7 lines · EXPERIMENTAL-NOT-ADOPTED		4.970 ±0.136
Ti I · Asplund et al. 2021 lines · <3D> NLTE (Gerber) Reference Grade · 7 lines · EXPERIMENTAL-NOT-ADOPTED		5.124 ±0.118
Ti I · Codex-graded lines · 1D LTE Codex Grade · 30 lines		4.912 ±0.081
Ti I · Codex-graded lines · 1D NLTE (Amarsi) Codex Grade · 29 lines		4.913 ±0.082
Ti I · Codex-graded lines · 1D NLTE (Gerber) Codex Grade · 28 lines		5.085 ±0.075
Ti I · Codex-graded lines · 1D LTE (Gerber) Codex Grade · 30 lines		4.925 ±0.080
Ti I · Codex-graded lines · <3D> LTE (Gerber) Codex Grade · 30 lines · EXPERIMENTAL-NOT-ADOPTED		5.012 ±0.079
Ti I · Codex-graded lines · <3D> NLTE (Gerber) Codex Grade · 30 lines · EXPERIMENTAL-NOT-ADOPTED		5.127 ±0.077
Ti I · reference lines · 1D LTE Reference Grade · 28 lines		4.912 ±0.083
Ti I · reference lines · 1D NLTE (Amarsi) Reference Grade · 27 lines		4.913 ±0.084
Ti I · reference lines · 1D NLTE (Gerber) Reference Grade · 26 lines		5.085 ±0.077
Ti I · reference lines · 1D LTE (Gerber) Reference Grade · 28 lines		4.925 ±0.081

red-optical — Kitt Peak (1984, molecfit)
A(Ti) dex; axis 4.68–5.30

Ti I · reference lines · <3D> LTE (Gerber) Reference Grade · 28 lines · EXPERIMENTAL-NOT-ADOPTED		5.012 ±0.079
Ti I · reference lines · <3D> NLTE (Gerber) Reference Grade · 28 lines · EXPERIMENTAL-NOT-ADOPTED		5.127 ±0.078

red-optical axis: 4.68 · 4.83 · 4.99 · 5.14 · 5.30 A(Ti) dex

NIR — IAG FTS
A(Ti) dex; axis 4.35–5.18

Ti II · Codex-graded lines · 1D LTE Codex Grade · 2 lines		4.808 ±0.084
Ti II · Codex-graded lines · 1D NLTE (Amarsi) Codex Grade · 2 lines		4.801 ±0.083
Ti II · Codex-graded lines · 1D NLTE (Gerber) Codex Grade · 2 lines		4.806 ±0.069
Ti II · Codex-graded lines · 1D LTE (Gerber) Codex Grade · 2 lines		4.796 ±0.083
Ti II · Codex-graded lines · <3D> LTE (Gerber) Codex Grade · 2 lines · EXPERIMENTAL-NOT-ADOPTED		4.832 ±0.089
Ti II · Codex-graded lines · <3D> NLTE (Gerber) Codex Grade · 2 lines · EXPERIMENTAL-NOT-ADOPTED		4.833 ±0.079
Ti II · reference lines · 1D LTE Reference Grade · 2 lines		4.808 ±0.084
Ti II · reference lines · 1D NLTE (Amarsi) Reference Grade · 2 lines		4.801 ±0.083
Ti II · reference lines · 1D NLTE (Gerber) Reference Grade · 2 lines		4.806 ±0.069
Ti II · reference lines · 1D LTE (Gerber) Reference Grade · 2 lines		4.796 ±0.083
Ti II · reference lines · <3D> LTE (Gerber) Reference Grade · 2 lines · EXPERIMENTAL-NOT-ADOPTED		4.832 ±0.089
Ti II · reference lines · <3D> NLTE (Gerber) Reference Grade · 2 lines · EXPERIMENTAL-NOT-ADOPTED		4.833 ±0.079

NIR — Kitt Peak (Kurucz 2005)
A(Ti) dex; axis 4.35–5.18

Ti II · Codex-graded lines · 1D LTE Codex Grade · 2 lines		4.982 ±0.067

NIR — Kitt Peak (Kurucz 2005)
A(Ti) dex; axis 4.35–5.18

Ti II · Codex-graded lines · 1D NLTE (Amarsi) Codex Grade · 2 lines		4.976 ±0.066
Ti II · Codex-graded lines · 1D NLTE (Gerber) Codex Grade · 2 lines		4.997 ±0.079
Ti II · Codex-graded lines · 1D LTE (Gerber) Codex Grade · 2 lines		4.970 ±0.066
Ti II · Codex-graded lines · <3D> LTE (Gerber) Codex Grade · 2 lines · EXPERIMENTAL-NOT-ADOPTED		5.006 ±0.071
Ti II · Codex-graded lines · <3D> NLTE (Gerber) Codex Grade · 2 lines · EXPERIMENTAL-NOT-ADOPTED		5.004 ±0.064
Ti II · reference lines · 1D LTE Reference Grade · 2 lines		4.982 ±0.067
Ti II · reference lines · 1D NLTE (Amarsi) Reference Grade · 2 lines		4.976 ±0.066
Ti II · reference lines · 1D NLTE (Gerber) Reference Grade · 2 lines		4.997 ±0.079
Ti II · reference lines · 1D LTE (Gerber) Reference Grade · 2 lines		4.970 ±0.066
Ti II · reference lines · <3D> LTE (Gerber) Reference Grade · 2 lines · EXPERIMENTAL-NOT-ADOPTED		5.006 ±0.071
Ti II · reference lines · <3D> NLTE (Gerber) Reference Grade · 2 lines · EXPERIMENTAL-NOT-ADOPTED		5.004 ±0.064

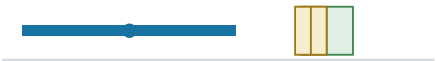
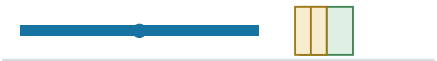
NIR — Kitt Peak (1984, molecfit)
A(Ti) dex; axis 4.35–5.18

Ti II · Codex-graded lines · 1D LTE Codex Grade · 2 lines		4.841 ±0.041
Ti II · Codex-graded lines · 1D NLTE (Amarsi) Codex Grade · 2 lines		4.834 ±0.041
Ti II · Codex-graded lines · 1D NLTE (Gerber) Codex Grade · 2 lines		4.838 ±0.045
Ti II · Codex-graded lines · 1D LTE (Gerber) Codex Grade · 2 lines		4.829 ±0.041
Ti II · Codex-graded lines · <3D> LTE (Gerber) Codex Grade · 2 lines · EXPERIMENTAL-NOT-ADOPTED		4.868 ±0.037
Ti II · Codex-graded lines · <3D> NLTE (Gerber) Codex Grade · 2 lines · EXPERIMENTAL-NOT-ADOPTED		4.870 ±0.038

NIR — Kitt Peak (1984, molecfit)
A(Ti) dex; axis 4.35–5.18

Ti II · reference lines · 1D LTE Reference Grade · 2 lines		4.841 ±0.041
Ti II · reference lines · 1D NLTE (Amarsi) Reference Grade · 2 lines		4.834 ±0.041
Ti II · reference lines · 1D NLTE (Gerber) Reference Grade · 2 lines		4.838 ±0.045
Ti II · reference lines · 1D LTE (Gerber) Reference Grade · 2 lines		4.829 ±0.041
Ti II · reference lines · <3D> LTE (Gerber) Reference Grade · 2 lines · EXPERIMENTAL-NOT-ADOPTED		4.868 ±0.037
Ti II · reference lines · <3D> NLTE (Gerber) Reference Grade · 2 lines · EXPERIMENTAL-NOT-ADOPTED		4.870 ±0.038
Ti I · Codex-graded lines · 1D LTE Codex Grade · 7 lines		4.818 ±0.098
Ti I · Codex-graded lines · 1D NLTE (Amarsi) Codex Grade · 7 lines		4.821 ±0.098
Ti I · Codex-graded lines · 1D NLTE (Gerber) Codex Grade · 7 lines		4.989 ±0.090
Ti I · Codex-graded lines · 1D LTE (Gerber) Codex Grade · 7 lines		4.813 ±0.094
Ti I · Codex-graded lines · <3D> LTE (Gerber) Codex Grade · 7 lines · EXPERIMENTAL-NOT-ADOPTED		4.933 ±0.098
Ti I · Codex-graded lines · <3D> NLTE (Gerber) Codex Grade · 7 lines · EXPERIMENTAL-NOT-ADOPTED		5.053 ±0.092
Ti I · reference lines · 1D LTE Reference Grade · 7 lines		4.818 ±0.098
Ti I · reference lines · 1D NLTE (Amarsi) Reference Grade · 7 lines		4.821 ±0.098
Ti I · reference lines · 1D NLTE (Gerber) Reference Grade · 7 lines		4.989 ±0.090
Ti I · reference lines · 1D LTE (Gerber) Reference Grade · 7 lines		4.813 ±0.094
Ti I · reference lines · <3D> LTE (Gerber) Reference Grade · 7 lines · EXPERIMENTAL-NOT-ADOPTED		4.933 ±0.098
Ti I · reference lines · <3D> NLTE (Gerber) Reference Grade · 7 lines · EXPERIMENTAL-NOT-ADOPTED		5.053 ±0.092

NIR — CRIRES+ J
A(Ti) dex; axis 4.35–5.18

Ti I · Codex-graded lines · 1D LTE Codex Grade · 6 lines		4.595 ±0.203
Ti I · Codex-graded lines · 1D NLTE (Amarsi) Codex Grade · 6 lines		4.587 ±0.204
Ti I · Codex-graded lines · 1D NLTE (Gerber) Codex Grade · 5 lines		4.798 ±0.137
Ti I · Codex-graded lines · 1D LTE (Gerber) Codex Grade · 6 lines		4.614 ±0.227
Ti I · Codex-graded lines · <3D> LTE (Gerber) Codex Grade · 6 lines · EXPERIMENTAL-NOT-ADOPTED		4.722 ±0.176
Ti I · Codex-graded lines · <3D> NLTE (Gerber) Codex Grade · 6 lines · EXPERIMENTAL-NOT-ADOPTED		4.840 ±0.166
Ti I · reference lines · 1D LTE Reference Grade · 6 lines		4.595 ±0.203
Ti I · reference lines · 1D NLTE (Amarsi) Reference Grade · 6 lines		4.587 ±0.204
Ti I · reference lines · 1D NLTE (Gerber) Reference Grade · 5 lines		4.798 ±0.137
Ti I · reference lines · 1D LTE (Gerber) Reference Grade · 6 lines		4.614 ±0.227
Ti I · reference lines · <3D> LTE (Gerber) Reference Grade · 6 lines · EXPERIMENTAL-NOT-ADOPTED		4.722 ±0.176
Ti I · reference lines · <3D> NLTE (Gerber) Reference Grade · 6 lines · EXPERIMENTAL-NOT-ADOPTED		4.840 ±0.166

NIR axis: 4.35 · 4.56 · 4.76 · 4.97 · 5.18 A(Ti) dex

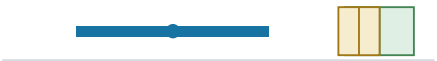
H — CRIRES+ H
A(Ti) dex; axis 4.42–5.05

Ti I · Codex-graded lines · 1D LTE Codex Grade · 5 lines		4.691 ±0.241
Ti I · Codex-graded lines · 1D NLTE (Amarsi) Codex Grade · 5 lines		4.718 ±0.241
Ti I · Codex-graded lines · 1D NLTE (Gerber) Codex Grade · 4 lines		4.860 ±0.076
Ti I · Codex-graded lines · 1D LTE (Gerber) Codex Grade · 5 lines		4.705 ±0.240
Ti I · Codex-graded lines · <3D> LTE (Gerber) Codex Grade · 5 lines · EXPERIMENTAL-NOT-ADOPTED		4.766 ±0.239

H — CRIRES+ H
A(Ti) dex; axis 4.42–5.05

Ti I · Codex-graded lines · <3D> NLTE (Gerber) Codex Grade · 4 lines · EXPERIMENTAL-NOT-ADOPTED		4.875 ±0.080
Ti I · reference lines · 1D LTE Reference Grade · 5 lines		4.691 ±0.241
Ti I · reference lines · 1D NLTE (Amarsi) Reference Grade · 5 lines		4.718 ±0.241
Ti I · reference lines · 1D NLTE (Gerber) Reference Grade · 4 lines		4.860 ±0.076
Ti I · reference lines · 1D LTE (Gerber) Reference Grade · 5 lines		4.705 ±0.240
Ti I · reference lines · <3D> LTE (Gerber) Reference Grade · 5 lines · EXPERIMENTAL-NOT-ADOPTED		4.766 ±0.239
Ti I · reference lines · <3D> NLTE (Gerber) Reference Grade · 4 lines · EXPERIMENTAL-NOT-ADOPTED		4.875 ±0.080

H — CRIRES+ H (full arm, telluric-corrected)
A(Ti) dex; axis 4.42–5.05

Ti I · Codex-graded lines · 1D LTE Codex Grade · 5 lines		4.669 ±0.140
Ti I · Codex-graded lines · 1D NLTE (Amarsi) Codex Grade · 5 lines		4.699 ±0.140
Ti I · Codex-graded lines · 1D NLTE (Gerber) Codex Grade · 5 lines		4.866 ±0.134
Ti I · Codex-graded lines · 1D LTE (Gerber) Codex Grade · 5 lines		4.691 ±0.139
Ti I · Codex-graded lines · <3D> LTE (Gerber) Codex Grade · 5 lines · EXPERIMENTAL-NOT-ADOPTED		4.749 ±0.128
Ti I · Codex-graded lines · <3D> NLTE (Gerber) Codex Grade · 5 lines · EXPERIMENTAL-NOT-ADOPTED		4.864 ±0.122
Ti I · reference lines · 1D LTE Reference Grade · 5 lines		4.669 ±0.140
Ti I · reference lines · 1D NLTE (Amarsi) Reference Grade · 5 lines		4.699 ±0.140
Ti I · reference lines · 1D NLTE (Gerber) Reference Grade · 5 lines		4.866 ±0.134
Ti I · reference lines · 1D LTE (Gerber) Reference Grade · 5 lines		4.691 ±0.139

H — CRIRES+ H (full arm, telluric-corrected)
A(Ti) dex; axis 4.42–5.05

Ti I · reference lines · <3D> LTE (Gerber) Reference Grade · 5 lines · EXPERIMENTAL-NOT-ADOPTED		4.749 ±0.128
Ti I · reference lines · <3D> NLTE (Gerber) Reference Grade · 5 lines · EXPERIMENTAL-NOT-ADOPTED		4.864 ±0.122

H axis: 4.42 · 4.58 · 4.74 · 4.89 · 5.05 A(Ti) dex

K — CRIRES+
A(Ti) dex; axis 4.57–5.12

Ti I · Codex-graded lines · 1D LTE Codex Grade · 11 lines		4.748 ±0.142
Ti I · Codex-graded lines · 1D NLTE (Amarsi) Codex Grade · 11 lines		4.768 ±0.142
Ti I · Codex-graded lines · 1D NLTE (Gerber) Codex Grade · 9 lines		4.922 ±0.079
Ti I · Codex-graded lines · 1D LTE (Gerber) Codex Grade · 11 lines		4.764 ±0.161
Ti I · Codex-graded lines · <3D> LTE (Gerber) Codex Grade · 10 lines · EXPERIMENTAL-NOT-ADOPTED		4.853 ±0.124
Ti I · Codex-graded lines · <3D> NLTE (Gerber) Codex Grade · 11 lines · EXPERIMENTAL-NOT-ADOPTED		4.932 ±0.157
Ti I · reference lines · 1D LTE Reference Grade · 11 lines		4.748 ±0.142
Ti I · reference lines · 1D NLTE (Amarsi) Reference Grade · 11 lines		4.768 ±0.142
Ti I · reference lines · 1D NLTE (Gerber) Reference Grade · 9 lines		4.922 ±0.079
Ti I · reference lines · 1D LTE (Gerber) Reference Grade · 11 lines		4.764 ±0.161
Ti I · reference lines · <3D> LTE (Gerber) Reference Grade · 10 lines · EXPERIMENTAL-NOT-ADOPTED		4.853 ±0.124
Ti I · reference lines · <3D> NLTE (Gerber) Reference Grade · 11 lines · EXPERIMENTAL-NOT-ADOPTED		4.932 ±0.157

K axis: 4.57 · 4.71 · 4.85 · 4.98 · 5.12 A(Ti) dex

How to read this forest. Each row is one independent product, preserving its band, holding, engine, indicator and line set. Engines and indicator families are never averaged. Each bar is the uncertainty as Asplund et al. 2021 quote it: line-to-line scatter, the 3D-model term and the NLTE term (at least 0.03 dex). For a molecule the NLTE term is replaced by its dependence on the other element, and the 3D term comes from the 3D-to-1D difference Amarsi et al. 2021 publish for the same band. Atomic-data and observational terms are not in the bar, as in Asplund; they stay in the full error budget attached to the row. Grades describe the

supplied line-pool provenance, not engine quality; evaluated theoretical CNO oscillator strengths are not relabelled as laboratory evidence. Quarantined, failed and unconstrained fits have no abundance mark. Experimental products remain explicitly not adopted. Literature references provide context, never tuning targets.

How this was measured

Every titanium value on this page comes from fitting synthetic spectra to the observed solar spectrum, line by line or band by band, with the titanium abundance as the free parameter. The synthesis includes the atomic lines and the molecular opacity in every window, so blended absorption is modelled rather than attributed to the line being measured. The continuum is placed locally around every line by comparing the observation with the synthesis on its own highest pixels, and ground-based spectra are telluric-corrected across their full range.

Each indicator is measured independently on each solar spectrum and reported separately; nothing is averaged across indicators or instruments. Where a 3D or NLTE correction is published for the lines, it is applied as its own product (1D-LTE, 1D-NLTE and 3D-NLTE are separate rows). Every value carries a full uncertainty budget: fit, line strengths, microturbulence, continuum, fit window, model atmosphere, telluric residual, and the spread between spectra, each measured by refitting with that one input changed. The headline at the top is the Asplund-grade product: a published line set, the most complete treatment, then the most lines.

Band	near-UV
What was measured	Ti I · Codex-graded lines; Ti II · Codex-graded lines
Solar spectra	Kitt Peak (1984, molecfit), Kitt Peak (Kurucz 2005)
Treatments	1D-LTE, 1D-NLTE, synth-mean3D-LTE-gerber-stagger, synth-mean3D-NLTE-gerber-stagger
Lines	4–15
Result A(Ti)	4.946–5.348 (synth-mean3D-LTE-gerber-stagger)
Largest uncertainty terms (dex)	fit / line-to-line scatter 0.13, model atmosphere 0.05

Band	near-UV
What was measured	Ti I · reference lines; Ti II · reference lines
Solar spectra	Kitt Peak (1984, molecfit), Kitt Peak (Kurucz 2005)
Treatments	1D-LTE, 1D-NLTE, synth-mean3D-LTE-gerber-stagger, synth-mean3D-NLTE-gerber-stagger
Lines	15–156
Result A(Ti)	5.106–5.459 (synth-mean3D-LTE-gerber-stagger)
Largest uncertainty terms (dex)	fit / line-to-line scatter 0.03, model atmosphere 0.02

Band	VIS
What was measured	Ti I · Codex-graded lines; Ti II · Codex-graded lines
Solar spectra	HARPS, Kitt Peak (1984, molecfit), Kitt Peak (Kurucz 2005)
Treatments	1D-LTE, 1D-NLTE, synth-mean3D-LTE-gerber-stagger, synth-mean3D-NLTE-gerber-stagger
Lines	46–106
Result A(Ti)	4.949–5.002 (synth-mean3D-LTE-gerber-stagger)
Largest uncertainty terms (dex)	model atmosphere 0.05, fit / line-to-line scatter 0.03

Band	VIS
What was measured	Ti I · reference lines; Ti II · reference lines
Solar spectra	HARPS, Kitt Peak (1984, molecfit), Kitt Peak (Kurucz 2005)
Treatments	1D-LTE, 1D-NLTE, synth-mean3D-LTE-gerber-stagger, synth-mean3D-NLTE-gerber-stagger
Lines	69–81
Result A(Ti)	4.956–5.018 (synth-mean3D-LTE-gerber-stagger)
Largest uncertainty terms (dex)	model atmosphere 0.05, fit / line-to-line scatter 0.03

Band	VIS
What was measured	Ti I · Asplund et al. 2021 lines; Ti II · Asplund et al. 2021 lines
Solar spectra	HARPS, Kitt Peak (1984, molecfit), Kitt Peak (Kurucz 2005)
Treatments	1D-LTE, 1D-NLTE, synth-mean3D-LTE-gerber-stagger, synth-mean3D-NLTE-gerber-stagger
Lines	13–27
Result A(Ti)	5.007–5.081 (synth-mean3D-NLTE-gerber-stagger)
Largest uncertainty terms (dex)	model atmosphere 0.05, fit / line-to-line scatter 0.02

Band	red-optical
What was measured	Ti I · Codex-graded lines; Ti II · Codex-graded lines
Solar spectra	IAG FTS, Kitt Peak (1984, molecfit), Kitt Peak (Kurucz 2005)
Treatments	1D-LTE, 1D-NLTE, synth-mean3D-LTE-gerber-stagger, synth-mean3D-NLTE-gerber-stagger
Lines	5–32
Result A(Ti)	5.048–5.133 (synth-mean3D-NLTE-gerber-stagger)
Largest uncertainty terms (dex)	fit / line-to-line scatter 0.06, model atmosphere 0.06

Band	red-optical
What was measured	Ti I · reference lines; Ti II · reference lines
Solar spectra	IAG FTS, Kitt Peak (1984, molecfit), Kitt Peak (Kurucz 2005)
Treatments	1D-LTE, 1D-NLTE, synth-mean3D-LTE-gerber-stagger, synth-mean3D-NLTE-gerber-stagger
Lines	5–30
Result A(Ti)	5.048–5.133 (synth-mean3D-NLTE-gerber-stagger)
Largest uncertainty terms (dex)	fit / line-to-line scatter 0.07, model atmosphere 0.06

Band	red-optical
What was measured	Ti I · Asplund et al. 2021 lines
Solar spectra	IAG FTS, Kitt Peak (1984, molecfit), Kitt Peak (Kurucz 2005)
Treatments	1D-LTE, 1D-NLTE, synth-mean3D-LTE-gerber-stagger, synth-mean3D-NLTE-gerber-stagger
Lines	7
Result A(Ti)	5.108–5.126 (synth-mean3D-NLTE-gerber-stagger)
Largest uncertainty terms (dex)	fit / line-to-line scatter 0.10, model atmosphere 0.06

Band	NIR
What was measured	Ti I · Codex-graded lines; Ti II · Codex-graded lines
Solar spectra	CRIRES+ J, IAG FTS, Kitt Peak (1984, molecfit), Kitt Peak (Kurucz 2005)
Treatments	1D-LTE, 1D-NLTE, synth-mean3D-LTE-gerber-stagger, synth-mean3D-NLTE-gerber-stagger
Lines	2–7
Result A(Ti)	4.833–5.053 (synth-mean3D-NLTE-gerber-stagger)
Largest uncertainty terms (dex)	fit / line-to-line scatter 0.07, model atmosphere 0.05

Band	NIR
What was measured	Ti I · reference lines; Ti II · reference lines
Solar spectra	CRIRES+ J, IAG FTS, Kitt Peak (1984, molecfit), Kitt Peak (Kurucz 2005)
Treatments	1D-LTE, 1D-NLTE, synth-mean3D-LTE-gerber-stagger, synth-mean3D-NLTE-gerber-stagger
Lines	2–7
Result A(Ti)	4.833–5.053 (synth-mean3D-NLTE-gerber-stagger)
Largest uncertainty terms (dex)	fit / line-to-line scatter 0.07, model atmosphere 0.05

Band	H
What was measured	Ti I · Codex-graded lines
Solar spectra	CRIRES+ H, CRIRES+ H (full arm, telluric-corrected)
Treatments	1D-LTE, 1D-NLTE, synth-mean3D-LTE-gerber-stagger, synth-mean3D-NLTE-gerber-stagger
Lines	4–5
Result A(Ti)	4.864–4.875 (synth-mean3D-NLTE-gerber-stagger)
Largest uncertainty terms (dex)	fit / line-to-line scatter 0.11, model atmosphere 0.05

Band	H
What was measured	Ti I · reference lines
Solar spectra	CRIRES+ H, CRIRES+ H (full arm, telluric-corrected)
Treatments	1D-LTE, 1D-NLTE, synth-mean3D-LTE-gerber-stagger, synth-mean3D-NLTE-gerber-stagger
Lines	4–5
Result A(Ti)	4.864–4.875 (synth-mean3D-NLTE-gerber-stagger)
Largest uncertainty terms (dex)	fit / line-to-line scatter 0.11, model atmosphere 0.05

Band	K
What was measured	Ti I · Codex-graded lines
Solar spectra	CRIRES+
Treatments	1D-LTE, 1D-NLTE, synth-mean3D-LTE-gerber-stagger, synth-mean3D-NLTE-gerber-stagger
Lines	9–11
Result A(Ti)	4.932 (synth-mean3D-NLTE-gerber-stagger)
Largest uncertainty terms (dex)	fit / line-to-line scatter 0.15, model atmosphere 0.05

Band	K
What was measured	Ti I · reference lines
Solar spectra	CRIRES+
Treatments	1D-LTE, 1D-NLTE, synth-mean3D-LTE-gerber-stagger, synth-mean3D-NLTE-gerber-stagger
Lines	9–11
Result A(Ti)	4.932 (synth-mean3D-NLTE-gerber-stagger)
Largest uncertainty terms (dex)	fit / line-to-line scatter 0.15, model atmosphere 0.05

Solar titanium context

Titanium is measured from neutral Ti I and ionized Ti II lines from the near-ultraviolet to the near-infrared. The reference lines are the Ti I and Ti II lines Asplund et al. 2021 used, with the oscillator strengths they adopted; a wider set of lines with laboratory oscillator strengths and the Codex's own line selection are shown as separate products. Ti I departs from LTE, so each spectrum also carries non-LTE products. No titanium line in the H or K band has a published oscillator-strength uncertainty, so those bands are gaps.

Published line sets · gf uncertainty model · Methodology

Download the evidence

Download PDF — Solar Ti appendix

Source feed — includes quarantined fit outputs, not adopted abundances

Complete product visibility audit

Shared website/PDF report

Reproducibility manifest

Complete references and product-to-source bindings

Reproducibility

Generated from the pinned science snapshot. Source commit 48db0c21bf3de01c477aa13ec86456bbc3473636
Feed Ti.json v1.685 · updated 2026-11-15T03:22:02Z
Generated 2026-11-15T08:52:31-07:00 (source commit timestamp)
Feed SHA-256 b02a65880419831096b62f5a7b72e307942ba1f6ef08f4bd03995476d56bed32
Generator scripts/generate_cno_publication.py v1.0.0

Pinned scientific source

References / Data & Model Sources

Sources are separated by their role. Registered grid lineage and quarantined diagnostics do not imply an adopted abundance or an applied correction.

See the source notes for the distinction between reference lineage and the treatment actually recorded in each feed entry.

Science and provenance source notes

Solar abundance and indicator analyses. Solar Ti comparison literature; not an adopted Codex abundance. Sources: [1], [2].

Atomic data and gf authorities. Ti II oscillator strengths of this pool, as the product's own uncertainty budget records them (with their lineage). Sources: [3].

Model and grid sources. Feed treatment: 1D-LTE synthesis (Turbospectrum); no NLTE/3D correction claimed. Sources: [4].

Model and grid sources. Feed treatment: 1D NLTE, per-line correction from the Mallinson et al. 2024 departure grid via PySME (data/nlte_grids/Ti_Mallinson2024_PySME.csv). Sources: [5].

Model and grid sources. Feed treatment: ENGINE-B-NLTE; Turbospectrum on the registered Gerber deck. The product retains its own atmosphere and ion identity. Sources: [4].

Model and grid sources. Feed treatment: synth-1D-LTE-gerber; Turbospectrum on the registered Gerber deck. The product retains its own atmosphere and ion identity. Sources: [4].

Model and grid sources. Feed treatment: synth-mean3D-LTE-gerber-stagger; Turbospectrum on the registered Gerber deck with the horizontally averaged 3D (<3D>) Stagger solar model; not a full 3D calculation. Sources: [4], [6].

Model and grid sources. Feed treatment: synth-mean3D-NLTE-gerber-stagger; Turbospectrum on the registered Gerber deck with the horizontally averaged 3D (<3D>) Stagger solar model; not a full 3D calculation. Sources: [4], [6].

Solar abundance and indicator analyses. Published line set TI_AGSS21 (the line selection). Sources: [7].

Atomic data and gf authorities. Ti I oscillator strengths of this pool, as the product's own uncertainty budget records them (with their lineage). Sources: [9].

Product-to-source index

NIR · IAG FTS · Ti II · Codex-graded lines · 1D LTE · [1], [2], [3], [4] Ti-products-7c65d6ac7e1e

NIR · IAG FTS · Ti II · Codex-graded lines · 1D NLTE (Amarsi) · [1], [2], [3], [5] Ti-products-44b0ca4d0c54

NIR · IAG FTS · Ti II · Codex-graded lines · 1D NLTE (Gerber) · [1], [2], [3], [4] Ti-products-1365c96fd02e

NIR · IAG FTS · Ti II · Codex-graded lines · 1D LTE (Gerber) · [1], [2], [3], [4] Ti-products-9cfccbb6cc8f

NIR · IAG FTS · Ti II · Codex-graded lines · <3D> LTE (Gerber) · [1], [2], [3], [4], [6] Ti-products-7a6708652ebe

NIR · IAG FTS · Ti II · Codex-graded lines · <3D> NLTE (Gerber) · [1], [2], [3], [4], [6] Ti-products-cb06c7065b39

NIR · IAG FTS · Ti II · reference lines · 1D LTE · [1], [2], [3], [4] Ti-products-d73e3cc00fb8

NIR · IAG FTS · Ti II · reference lines · 1D NLTE (Amarsi) · [1], [2], [3], [5] Ti-products-077412e3635a

NIR · IAG FTS · Ti II · reference lines · 1D NLTE (Gerber) · [1], [2], [3], [4] Ti-products-d76f9cfc03a1

NIR · IAG FTS · Ti II · reference lines · 1D LTE (Gerber) · [1], [2], [3], [4] Ti-products-483ff025867e

NIR · IAG FTS · Ti II · reference lines · <3D> LTE (Gerber) · [1], [2], [3], [4], [6] Ti-products-a03f7efb9a31

NIR · IAG FTS · Ti II · reference lines · <3D> NLTE (Gerber) · [1], [2], [3], [4], [6] Ti-products-0e4842d1d04a

NIR · Kitt Peak (Kurucz 2005) · Ti II · Codex-graded lines · 1D LTE · [1], [2], [3], [4] Ti-products-e6fef024df32

NIR · Kitt Peak (Kurucz 2005) · Ti II · Codex-graded lines · 1D NLTE (Amarsi) · [1], [2], [3], [5] Ti-products-1da40f4707d2

NIR · Kitt Peak (Kurucz 2005) · Ti II · Codex-graded lines · 1D NLTE (Gerber) · [1], [2], [3], [4] Ti-products-0e1a979f5403

NIR · Kitt Peak (Kurucz 2005) · Ti II · Codex-graded lines · 1D LTE (Gerber) · [1], [2], [3], [4] Ti-products-115d30ca3ff5

NIR · Kitt Peak (Kurucz 2005) · Ti II · Codex-graded lines · <3D> LTE (Gerber) · [1], [2], [3], [4], [6] Ti-products-5607ac79cf6e

NIR · Kitt Peak (Kurucz 2005) · Ti II · Codex-graded lines · <3D> NLTE (Gerber) · [1], [2], [3], [4], [6] Ti-products-06e94cebbadd

NIR · Kitt Peak (Kurucz 2005) · Ti II · reference lines · 1D LTE · [1], [2], [3], [4] Ti-products-cfd2248a6726

NIR · Kitt Peak (Kurucz 2005) · Ti II · reference lines · 1D NLTE (Amarsi) · [1], [2], [3], [5] Ti-products-989186eb9693

NIR · Kitt Peak (Kurucz 2005) · Ti II · reference lines · 1D NLTE (Gerber) · [1], [2], [3], [4] Ti-products-0b07ef2612c1

NIR · Kitt Peak (Kurucz 2005) · Ti II · reference lines · 1D LTE (Gerber) · [1], [2], [3], [4] Ti-products-a33c3c405ded

NIR · Kitt Peak (Kurucz 2005) · Ti II · reference lines · <3D> LTE (Gerber) · [1], [2], [3], [4], [6] Ti-products-92a763507351

NIR · Kitt Peak (Kurucz 2005) · Ti II · reference lines · <3D> NLTE (Gerber) · [1], [2], [3], [4], [6] Ti-products-bf839a73dd43

NIR · Kitt Peak (1984, molecfit) · Ti II · Codex-graded lines · 1D LTE · [1], [2], [3], [4] Ti-products-8d38f954b0d7

NIR · Kitt Peak (1984, molecfit) · Ti II · Codex-graded lines · 1D NLTE (Amarsi) · [1], [2], [3], [5] Ti-products-4a3602c97064

NIR · Kitt Peak (1984, molecfit) · Ti II · Codex-graded lines · 1D NLTE (Gerber) · [1], [2], [3], [4] Ti-products-81efa4904b76

NIR · Kitt Peak (1984, molecfit) · Ti II · Codex-graded lines · 1D LTE (Gerber) · [1], [2], [3], [4] Ti-products-030bec174b78

NIR · Kitt Peak (1984, molecfit) · Ti II · Codex-graded lines · <3D> LTE (Gerber) · [1], [2], [3], [4], [6] Ti-products-af56f4b36903

NIR · Kitt Peak (1984, molecfit) · Ti II · Codex-graded lines · <3D> NLTE (Gerber) · [1], [2], [3], [4], [6] Ti-products-3b09e1a7f9d1

NIR · Kitt Peak (1984, molecfit) · Ti II · reference lines · 1D LTE · [1], [2], [3], [4] Ti-products-3e3ab1923bc6

NIR · Kitt Peak (1984, molecfit) · Ti II · reference lines · 1D NLTE (Amarsi) · [1], [2], [3], [5] Ti-products-f038a3515310

NIR · Kitt Peak (1984, molecfit) · Ti II · reference lines · 1D NLTE (Gerber) · [1], [2], [3], [4] Ti-products-27f7394df385

NIR · Kitt Peak (1984, molecfit) · Ti II · reference lines · 1D LTE (Gerber) · [1], [2], [3], [4] Ti-products-50d036a84c95

NIR · Kitt Peak (1984, molecfit) · Ti II · reference lines · <3D> LTE (Gerber) · [1], [2], [3], [4], [6] Ti-products-d8c0ae85563e

NIR · Kitt Peak (1984, molecfit) · Ti II · reference lines · <3D> NLTE (Gerber) · [1], [2], [3], [4], [6] Ti-products-ac430502a531

VIS · HARPS · Ti II · Asplund et al. 2021 lines · 1D LTE · [1], [2], [7], [3], [4] Ti-products-2c9ad7123f90

VIS · HARPS · Ti II · Asplund et al. 2021 lines · 1D NLTE (Amarsi) · [1], [2], [7], [3], [5] Ti-products-e64a185318e0

VIS · HARPS · Ti II · Asplund et al. 2021 lines · 1D NLTE (Gerber) · [1], [2], [7], [3], [4] Ti-products-3fcc4ef7e023

VIS · HARPS · Ti II · Asplund et al. 2021 lines · 1D LTE (Gerber) · [1], [2], [7], [3], [4] Ti-products-8aaaaf01ac1a

VIS · HARPS · Ti II · Asplund et al. 2021 lines · <3D> LTE (Gerber) · [1], [2], [7], [3], [4], [6] Ti-products-189bdc57c855

VIS · HARPS · Ti II · Asplund et al. 2021 lines · <3D> NLTE (Gerber) · [1], [2], [7], [3], [4], [6] Ti-products-22b4f69a86f3

VIS · HARPS · Ti II · Codex-graded lines · 1D LTE · [1], [2], [3], [8], [4] Ti-products-fc042103ed7a

VIS · HARPS · Ti II · Codex-graded lines · 1D NLTE (Amarsi) · [1], [2], [3], [8], [5] Ti-products-6738a2f585da

VIS · HARPS · Ti II · Codex-graded lines · 1D NLTE (Gerber) · [1], [2], [3], [8], [4] Ti-products-6cac92692eb0

VIS · HARPS · Ti II · Codex-graded lines · 1D LTE (Gerber) · [1], [2], [3], [8], [4] Ti-products-723ee7dcdb1f

VIS · HARPS · Ti II · Codex-graded lines · <3D> LTE (Gerber) · [1], [2], [3], [8], [4], [6] Ti-products-ba8e089c5ff5

VIS · HARPS · Ti II · Codex-graded lines · <3D> NLTE (Gerber) · [1], [2], [3], [8], [4], [6] Ti-products-8f82575b6597

VIS · HARPS · Ti II · reference lines · 1D LTE · [1], [2], [3], [4] Ti-products-aec09df6883a

VIS · HARPS · Ti II · reference lines · 1D NLTE (Amarsi) · [1], [2], [3], [5] Ti-products-4c065e118983

VIS · HARPS · Ti II · reference lines · 1D NLTE (Gerber) · [1], [2], [3], [4] Ti-products-6e315ced43a6

VIS · HARPS · Ti II · reference lines · 1D LTE (Gerber) · [1], [2], [3], [4] Ti-products-6656fe1d2c26

VIS · HARPS · Ti II · reference lines · <3D> LTE (Gerber) · [1], [2], [3], [4], [6] Ti-products-47cb882fa534

VIS · HARPS · Ti II · reference lines · <3D> NLTE (Gerber) · [1], [2], [3], [4], [6] Ti-products-6426c2d45a03

VIS · Kitt Peak (Kurucz 2005) · Ti II · Asplund et al. 2021 lines · 1D LTE · [1], [2], [7], [3], [4] Ti-products-a8d41937d55f

VIS · Kitt Peak (Kurucz 2005) · Ti II · Asplund et al. 2021 lines · 1D NLTE (Amarsi) · [1], [2], [7], [3], [5] Ti-products-0f9a36b9ecee

VIS · Kitt Peak (Kurucz 2005) · Ti II · Asplund et al. 2021 lines · 1D NLTE (Gerber) · [1], [2], [7], [3], [4] Ti-products-fae3717ba6b7

VIS · Kitt Peak (Kurucz 2005) · Ti II · Asplund et al. 2021 lines · 1D LTE (Gerber) · [1], [2], [7], [3], [4] Ti-products-2109b14f8d1d

VIS · Kitt Peak (Kurucz 2005) · Ti II · Asplund et al. 2021 lines · <3D> LTE (Gerber) · [1], [2], [7], [3], [4], [6] Ti-products-d92aeeddffd0

VIS · Kitt Peak (Kurucz 2005) · Ti II · Asplund et al. 2021 lines · <3D> NLTE (Gerber) · [1], [2], [7], [3], [4], [6] Ti-products-82f585de9d5d

VIS · Kitt Peak (Kurucz 2005) · Ti II · Codex-graded lines · 1D LTE · [1], [2], [3], [8], [4] Ti-products-aa4864206da2

VIS · Kitt Peak (Kurucz 2005) · Ti II · Codex-graded lines · 1D NLTE (Amarsi) · [1], [2], [3], [8], [5] Ti-products-41da8a86fa42

VIS · Kitt Peak (Kurucz 2005) · Ti II · Codex-graded lines · 1D NLTE (Gerber) · [1], [2], [3], [8], [4] Ti-products-a4b2f35eb9fb

VIS · Kitt Peak (Kurucz 2005) · Ti II · Codex-graded lines · 1D LTE (Gerber) · [1], [2], [3], [8], [4] Ti-products-9ad74a2cde90

VIS · Kitt Peak (Kurucz 2005) · Ti II · Codex-graded lines · <3D> LTE (Gerber) · [1], [2], [3], [8], [4], [6] Ti-products-40392a8debc8

VIS · Kitt Peak (Kurucz 2005) · Ti II · Codex-graded lines · <3D> NLTE (Gerber) · [1], [2], [3], [8], [4], [6] Ti-products-fb8157735e46

VIS · Kitt Peak (Kurucz 2005) · Ti II · reference lines · 1D LTE · [1], [2], [3], [4] Ti-products-8ca67611b0a0

VIS · Kitt Peak (Kurucz 2005) · Ti II · reference lines · 1D NLTE (Amarsi) · [1], [2], [3], [5] Ti-products-096bf639adc7

VIS · Kitt Peak (Kurucz 2005) · Ti II · reference lines · 1D NLTE (Gerber) · [1], [2], [3], [4] Ti-products-cc4dfd9548eb

VIS · Kitt Peak (Kurucz 2005) · Ti II · reference lines · 1D LTE (Gerber) · [1], [2], [3], [4] Ti-products-617c5f87c5c1

VIS · Kitt Peak (Kurucz 2005) · Ti II · reference lines · <3D> LTE (Gerber) · [1], [2], [3], [4], [6] Ti-products-d0eef26bd9e9

VIS · Kitt Peak (Kurucz 2005) · Ti II · reference lines · <3D> NLTE (Gerber) · [1], [2], [3], [4], [6] Ti-products-c5d7ddc9de9f

VIS · Kitt Peak (1984, molecfit) · Ti II · Asplund et al. 2021 lines · 1D LTE · [1], [2], [7], [3], [4] Ti-products-2183c3bf85be

VIS · Kitt Peak (1984, molecfit) · Ti II · Asplund et al. 2021 lines · 1D NLTE (Amarsi) · [1], [2], [7], [3], [5] Ti-products-fdde509e67e1

VIS · Kitt Peak (1984, molecfit) · Ti II · Asplund et al. 2021 lines · 1D NLTE (Gerber) · [1], [2], [7], [3], [4] Ti-products-a942d756e62c

VIS · Kitt Peak (1984, molecfit) · Ti II · Asplund et al. 2021 lines · 1D LTE (Gerber) · [1], [2], [7], [3], [4] Ti-products-2e4fb0aedba2

VIS · Kitt Peak (1984, molecfit) · Ti II · Asplund et al. 2021 lines · <3D> LTE (Gerber) · [1], [2], [7], [3], [4], [6] Ti-products-a27eddaf695d

VIS · Kitt Peak (1984, molecfit) · Ti II · Asplund et al. 2021 lines · <3D> NLTE (Gerber) · [1], [2], [7], [3], [4], [6] Ti-products-94f973fdf79a

VIS · Kitt Peak (1984, molecfit) · Ti II · Codex-graded lines · 1D LTE · [1], [2], [3], [8], [4] Ti-products-f0cf64ae409e

VIS · Kitt Peak (1984, molecfit) · Ti II · Codex-graded lines · 1D NLTE (Amarsi) · [1], [2], [3], [8], [5] Ti-products-cd06ba9cfd18

VIS · Kitt Peak (1984, molecfit) · Ti II · Codex-graded lines · 1D NLTE (Gerber) · [1], [2], [3], [8], [4] Ti-products-f521cfd6c101

VIS · Kitt Peak (1984, molecfit) · Ti II · Codex-graded lines · 1D LTE (Gerber) · [1], [2], [3], [8], [4] Ti-products-5c721eed5ca3

VIS · Kitt Peak (1984, molecfit) · Ti II · Codex-graded lines · <3D> LTE (Gerber) · [1], [2], [3], [8], [4], [6] Ti-products-30af6935dca1

VIS · Kitt Peak (1984, molecfit) · Ti II · Codex-graded lines · <3D> NLTE (Gerber) · [1], [2], [3], [8], [4], [6] Ti-products-3cb64e50dabc

VIS · Kitt Peak (1984, molecfit) · Ti II · reference lines · 1D LTE · [1], [2], [3], [4] Ti-products-a7d756f143f7

VIS · Kitt Peak (1984, molecfit) · Ti II · reference lines · 1D NLTE (Amarsi) · [1], [2], [3], [5] Ti-products-7b4be941c8c1

VIS · Kitt Peak (1984, molecfit) · Ti II · reference lines · 1D NLTE (Gerber) · [1], [2], [3], [4] Ti-products-9c061994e041

VIS · Kitt Peak (1984, molecfit) · Ti II · reference lines · 1D LTE (Gerber) · [1], [2], [3], [4] Ti-products-374d7ab89262

VIS · Kitt Peak (1984, molecfit) · Ti II · reference lines · <3D> LTE (Gerber) · [1], [2], [3], [4], [6] Ti-products-f7a046325126

VIS · Kitt Peak (1984, molecfit) · Ti II · reference lines · <3D> NLTE (Gerber) · [1], [2], [3], [4], [6] Ti-products-2e8e5de89d78

near-UV · Kitt Peak (Kurucz 2005) · Ti II · Codex-graded lines · 1D LTE · [1], [2], [3], [4] Ti-products-c43d190e2acc

near-UV · Kitt Peak (Kurucz 2005) · Ti II · Codex-graded lines · 1D NLTE (Amarsi) · [1], [2], [3], [5] Ti-products-4aaf11a66098

near-UV · Kitt Peak (Kurucz 2005) · Ti II · Codex-graded lines · 1D NLTE (Gerber) · [1], [2], [3], [4] Ti-products-4460d017cdb1

near-UV · Kitt Peak (Kurucz 2005) · Ti II · Codex-graded lines · 1D LTE (Gerber) · [1], [2], [3], [4] Ti-products-d9351369a0b6

near-UV · Kitt Peak (Kurucz 2005) · Ti II · Codex-graded lines · <3D> LTE (Gerber) · [1], [2], [3], [4], [6] Ti-products-509178a4cf19

near-UV · Kitt Peak (Kurucz 2005) · Ti II · Codex-graded lines · <3D> NLTE (Gerber) · [1], [2], [3], [4], [6] Ti-products-f1c1e95d6a37

near-UV · Kitt Peak (Kurucz 2005) · Ti II · reference lines · 1D LTE · [1], [2], [3], [4] Ti-products-206290b43cd9

near-UV · Kitt Peak (Kurucz 2005) · Ti II · reference lines · 1D NLTE (Amarsi) · [1], [2], [3], [5] Ti-products-63849d06ded0

near-UV · Kitt Peak (Kurucz 2005) · Ti II · reference lines · 1D NLTE (Gerber) · [1], [2], [3], [4] Ti-products-f5ccf0395c54

near-UV · Kitt Peak (Kurucz 2005) · Ti II · reference lines · 1D LTE (Gerber) · [1], [2], [3], [4] Ti-products-121a17805bf9

near-UV · Kitt Peak (Kurucz 2005) · Ti II · reference lines · <3D> LTE (Gerber) · [1], [2], [3], [4], [6] Ti-products-6d1d43f16fe6

near-UV · Kitt Peak (Kurucz 2005) · Ti II · reference lines · <3D> NLTE (Gerber) · [1], [2], [3], [4], [6] Ti-products-dc897ab0bfe2

near-UV · Kitt Peak (1984, molecfit) · Ti II · Codex-graded lines · 1D LTE · [1], [2], [3], [4] Ti-products-5e4b5154abd4

near-UV · Kitt Peak (1984, molecfit) · Ti II · Codex-graded lines · 1D NLTE (Amarsi) · [1], [2], [3], [5] Ti-products-d87830f69068

near-UV · Kitt Peak (1984, molecfit) · Ti II · Codex-graded lines · 1D NLTE (Gerber) · [1], [2], [3], [4] Ti-products-d8ebd19befae

near-UV · Kitt Peak (1984, molecfit) · Ti II · Codex-graded lines · 1D LTE (Gerber) · [1], [2], [3], [4] Ti-products-c7a18d1655b5

near-UV · Kitt Peak (1984, molecfit) · Ti II · Codex-graded lines · <3D> LTE (Gerber) · [1], [2], [3], [4], [6] Ti-products-b4ca3df6eede

near-UV · Kitt Peak (1984, molecfit) · Ti II · Codex-graded lines · <3D> NLTE (Gerber) · [1], [2], [3], [4], [6] Ti-products-71f5bd6dbabf

near-UV · Kitt Peak (1984, molecfit) · Ti II · reference lines · 1D LTE · [1], [2], [3], [4] Ti-products-ef1616f06cbe

near-UV · Kitt Peak (1984, molecfit) · Ti II · reference lines · 1D NLTE (Amarsi) · [1], [2], [3], [5] Ti-products-f88608578841

near-UV · Kitt Peak (1984, molecfit) · Ti II · reference lines · 1D NLTE (Gerber) · [1], [2], [3], [4] Ti-products-04880367c1d0

near-UV · Kitt Peak (1984, molecfit) · Ti II · reference lines · 1D LTE (Gerber) · [1], [2], [3], [4] Ti-products-85cda524f86d

near-UV · Kitt Peak (1984, molecfit) · Ti II · reference lines · <3D> LTE (Gerber) · [1], [2], [3], [4], [6] Ti-products-fb7cf7b619f1

near-UV · Kitt Peak (1984, molecfit) · Ti II · reference lines · <3D> NLTE (Gerber) · [1], [2], [3], [4], [6] Ti-products-a52c3ee2aa12

red-optical · IAG FTS · Ti II · Codex-graded lines · 1D LTE · [1], [2], [3], [4] Ti-products-181fd3ccbbd7

red-optical · IAG FTS · Ti II · Codex-graded lines · 1D NLTE (Amarsi) · [1], [2], [3], [5] Ti-products-c7b92de79ee8

red-optical · IAG FTS · Ti II · Codex-graded lines · 1D NLTE (Gerber) · [1], [2], [3], [4] Ti-products-8aa32169d3dd

red-optical · IAG FTS · Ti II · Codex-graded lines · 1D LTE (Gerber) · [1], [2], [3], [4] Ti-products-a1c67a8393aa

red-optical · IAG FTS · Ti II · Codex-graded lines · <3D> LTE (Gerber) · [1], [2], [3], [4], [6] Ti-products-0481a85a39ff

red-optical · IAG FTS · Ti II · Codex-graded lines · <3D> NLTE (Gerber) · [1], [2], [3], [4], [6] Ti-products-cd6301a7115d

red-optical · IAG FTS · Ti II · reference lines · 1D LTE · [1], [2], [3], [4] Ti-products-b9fd0a6e8b87

red-optical · IAG FTS · Ti II · reference lines · 1D NLTE (Amarsi) · [1], [2], [3], [5] Ti-products-214266ebf9ba

red-optical · IAG FTS · Ti II · reference lines · 1D NLTE (Gerber) · [1], [2], [3], [4] Ti-products-23cf54ee763e

red-optical · IAG FTS · Ti II · reference lines · 1D LTE (Gerber) · [1], [2], [3], [4] Ti-products-d305fb48b011

red-optical · IAG FTS · Ti II · reference lines · <3D> LTE (Gerber) · [1], [2], [3], [4], [6] Ti-products-c722f2cf5fe5

red-optical · IAG FTS · Ti II · reference lines · <3D> NLTE (Gerber) · [1], [2], [3], [4], [6] Ti-products-5c3f6efd4d7b

red-optical · Kitt Peak (Kurucz 2005) · Ti II · Codex-graded lines · 1D LTE · [1], [2], [3], [4] Ti-products-7bd50ca0f43d

red-optical · Kitt Peak (Kurucz 2005) · Ti II · Codex-graded lines · 1D NLTE (Amarsi) · [1], [2], [3], [5] Ti-products-c78798edcaaf

red-optical · Kitt Peak (Kurucz 2005) · Ti II · Codex-graded lines · 1D NLTE (Gerber) · [1], [2], [3], [4] Ti-products-231aab32af56

red-optical · Kitt Peak (Kurucz 2005) · Ti II · Codex-graded lines · 1D LTE (Gerber) · [1], [2], [3], [4] Ti-products-460068377c46

red-optical · Kitt Peak (Kurucz 2005) · Ti II · Codex-graded lines · <3D> LTE (Gerber) · [1], [2], [3], [4], [6] Ti-products-2f243605026b

red-optical · Kitt Peak (Kurucz 2005) · Ti II · Codex-graded lines · <3D> NLTE (Gerber) · [1], [2], [3], [4], [6] Ti-products-b076a0a690d1

red-optical · Kitt Peak (Kurucz 2005) · Ti II · reference lines · 1D LTE · [1], [2], [3], [4] Ti-products-cac08c4eeac4

red-optical · Kitt Peak (Kurucz 2005) · Ti II · reference lines · 1D NLTE (Amarsi) · [1], [2], [3], [5] Ti-products-bef62d63ebec

red-optical · Kitt Peak (Kurucz 2005) · Ti II · reference lines · 1D NLTE (Gerber) · [1], [2], [3], [4] Ti-products-4141f2b8fd61

red-optical · Kitt Peak (Kurucz 2005) · Ti II · reference lines · 1D LTE (Gerber) · [1], [2], [3], [4] Ti-products-d4c6e74deb11

red-optical · Kitt Peak (Kurucz 2005) · Ti II · reference lines · <3D> LTE (Gerber) · [1], [2], [3], [4], [6] Ti-products-70c2532d6eeb

red-optical · Kitt Peak (Kurucz 2005) · Ti II · reference lines · <3D> NLTE (Gerber) · [1], [2], [3], [4], [6] Ti-products-64b3a157e60d

red-optical · Kitt Peak (1984, molecfit) · Ti II · Codex-graded lines · 1D LTE · [1], [2], [3], [4] Ti-products-8fbbb99e290e

red-optical · Kitt Peak (1984, molecfit) · Ti II · Codex-graded lines · 1D NLTE (Amarsi) · [1], [2], [3], [5] Ti-products-d953f437f0fb

red-optical · Kitt Peak (1984, molecfit) · Ti II · Codex-graded lines · 1D NLTE (Gerber) · [1], [2], [3], [4] Ti-products-bf40832e7648

red-optical · Kitt Peak (1984, molecfit) · Ti II · Codex-graded lines · 1D LTE (Gerber) · [1], [2], [3], [4] Ti-products-464acb032126

red-optical · Kitt Peak (1984, molecfit) · Ti II · Codex-graded lines · <3D> LTE (Gerber) · [1], [2], [3], [4], [6] Ti-products-0045d6767454

red-optical · Kitt Peak (1984, molecfit) · Ti II · Codex-graded lines · <3D> NLTE (Gerber) · [1], [2], [3], [4], [6] Ti-products-9c52791bd422

red-optical · Kitt Peak (1984, molecfit) · Ti II · reference lines · 1D LTE · [1], [2], [3], [4] Ti-products-5adbd47debf1

red-optical · Kitt Peak (1984, molecfit) · Ti II · reference lines · 1D NLTE (Amarsi) · [1], [2], [3], [5] Ti-products-3ac134114773

red-optical · Kitt Peak (1984, molecfit) · Ti II · reference lines · 1D NLTE (Gerber) · [1], [2], [3], [4] Ti-products-dea62bec5093

red-optical · Kitt Peak (1984, molecfit) · Ti II · reference lines · 1D LTE (Gerber) · [1], [2], [3], [4] Ti-products-eefa1c832dd9

red-optical · Kitt Peak (1984, molecfit) · Ti II · reference lines · <3D> LTE (Gerber) · [1], [2], [3], [4], [6] Ti-products-b0ce36bb68dd

red-optical · Kitt Peak (1984, molecfit) · Ti II · reference lines · <3D> NLTE (Gerber) · [1], [2], [3], [4], [6] Ti-products-4908df1ce17b

H · CRIRES+ H · Ti I · Codex-graded lines · 1D LTE · [1], [2], [9], [4] Ti-products-d2c4c83304df

H · CRIRES+ H · Ti I · Codex-graded lines · 1D NLTE (Amarsi) · [1], [2], [9], [5] Ti-products-cb365f06d0e2

H · CRIRES+ H · Ti I · Codex-graded lines · 1D NLTE (Gerber) · [1], [2], [9], [4] Ti-products-61bd7949541d

H · CRIRES+ H · Ti I · Codex-graded lines · 1D LTE (Gerber) · [1], [2], [9], [4] Ti-products-17f09adf6748

H · CRIRES+ H · Ti I · Codex-graded lines · <3D> LTE (Gerber) · [1], [2], [9], [4], [6] Ti-products-fc90adf35fbf

H · CRIRES+ H · Ti I · Codex-graded lines · <3D> NLTE (Gerber) · [1], [2], [9], [4], [6] Ti-products-ecac625732a6

H · CRIRES+ H · Ti I · reference lines · 1D LTE · [1], [2], [9], [4] Ti-products-13a119d84a9d

H · CRIRES+ H · Ti I · reference lines · 1D NLTE (Amarsi) · [1], [2], [9], [5] Ti-products-f8ad6f5935b3

H · CRIRES+ H · Ti I · reference lines · 1D NLTE (Gerber) · [1], [2], [9], [4] Ti-products-83323fe9a34d

H · CRIRES+ H · Ti I · reference lines · 1D LTE (Gerber) · [1], [2], [9], [4] Ti-products-de39a18fea2f

H · CRIRES+ H · Ti I · reference lines · <3D> LTE (Gerber) · [1], [2], [9], [4], [6] Ti-products-bda553230b63

H · CRIRES+ H · Ti I · reference lines · <3D> NLTE (Gerber) · [1], [2], [9], [4], [6] Ti-products-dcb02f103251

H · CRIRES+ H (full arm, telluric-corrected) · Ti I · Codex-graded lines · 1D LTE · [1], [2], [9], [4] Ti-products-7693f3614ffe

H · CRIRES+ H (full arm, telluric-corrected) · Ti I · Codex-graded lines · 1D NLTE (Amarsi) · [1], [2], [9], [5] Ti-products-8a951c905f50

H · CRIRES+ H (full arm, telluric-corrected) · Ti I · Codex-graded lines · 1D NLTE (Gerber) · [1], [2], [9], [4] Ti-products-f9d6cc25b73e

H · CRIRES+ H (full arm, telluric-corrected) · Ti I · Codex-graded lines · 1D LTE (Gerber) · [1], [2], [9], [4] Ti-products-c0af0b068f2a

H · CRIRES+ H (full arm, telluric-corrected) · Ti I · Codex-graded lines · <3D> LTE (Gerber) · [1], [2], [9], [4], [6] Ti-products-239e66a1258c

H · CRIRES+ H (full arm, telluric-corrected) · Ti I · Codex-graded lines · <3D> NLTE (Gerber) · [1], [2], [9], [4], [6] Ti-products-a446aa8db338

H · CRIRES+ H (full arm, telluric-corrected) · Ti I · reference lines · 1D LTE · [1], [2], [9], [4] Ti-products-ff9f10197c80

H · CRIRES+ H (full arm, telluric-corrected) · Ti I · reference lines · 1D NLTE (Amarsi) · [1], [2], [9], [5] Ti-products-3897f91261ac

H · CRIRES+ H (full arm, telluric-corrected) · Ti I · reference lines · 1D NLTE (Gerber) · [1], [2], [9], [4] Ti-products-393e2d7fa1f0

H · CRIRES+ H (full arm, telluric-corrected) · Ti I · reference lines · 1D LTE (Gerber) · [1], [2], [9], [4] Ti-products-9d602c73d0ed

H · CRIRES+ H (full arm, telluric-corrected) · Ti I · reference lines · <3D> LTE (Gerber) · [1], [2], [9], [4], [6] Ti-products-7d72f05fb19c

H · CRIRES+ H (full arm, telluric-corrected) · Ti I · reference lines · <3D> NLTE (Gerber) · [1], [2], [9], [4], [6] Ti-products-60d0b83f1efa

K · CRIRES+ · Ti I · Codex-graded lines · 1D LTE · [1], [2], [9], [10], [4] Ti-products-6afd09595f1d

K · CRIRES+ · Ti I · Codex-graded lines · 1D NLTE (Amarsi) · [1], [2], [9], [10], [5] Ti-products-4e199512b892

K · CRIRES+ · Ti I · Codex-graded lines · 1D NLTE (Gerber) · [1], [2], [9], [10], [4] Ti-products-3c767896ee6f

K · CRIRES+ · Ti I · Codex-graded lines · 1D LTE (Gerber) · [1], [2], [9], [10], [4] Ti-products-cae64fae86f1

K · CRIRES+ · Ti I · Codex-graded lines · <3D> LTE (Gerber) · [1], [2], [9], [10], [4], [6] Ti-products-69348f48b35c

K · CRIRES+ · Ti I · Codex-graded lines · <3D> NLTE (Gerber) · [1], [2], [9], [10], [4], [6] Ti-products-1d74911ffc4e

K · CRIRES+ · Ti I · reference lines · 1D LTE · [1], [2], [9], [10], [4] Ti-products-07d5c23f8a30

K · CRIRES+ · Ti I · reference lines · 1D NLTE (Amarsi) · [1], [2], [9], [10], [5] Ti-products-581f743fb43d

K · CRIRES+ · Ti I · reference lines · 1D NLTE (Gerber) · [1], [2], [9], [10], [4] Ti-products-3318fe09823e

K · CRIRES+ · Ti I · reference lines · 1D LTE (Gerber) · [1], [2], [9], [10], [4] Ti-products-80b36661ce64

K · CRIRES+ · Ti I · reference lines · <3D> LTE (Gerber) · [1], [2], [9], [10], [4], [6] Ti-products-48b486e5d256

K · CRIRES+ · Ti I · reference lines · <3D> NLTE (Gerber) · [1], [2], [9], [10], [4], [6] Ti-products-c6ecb50573ad

NIR · CRIRES+ J · Ti I · Codex-graded lines · 1D LTE · [1], [2], [10], [4] Ti-products-c8e71b8ad992

NIR · CRIRES+ J · Ti I · Codex-graded lines · 1D NLTE (Amarsi) · [1], [2], [10], [5] Ti-products-6d015675e3d3

NIR · CRIRES+ J · Ti I · Codex-graded lines · 1D NLTE (Gerber) · [1], [2], [10], [4] Ti-products-d1f61926ee29

NIR · CRIRES+ J · Ti I · Codex-graded lines · 1D LTE (Gerber) · [1], [2], [10], [4] Ti-products-44ef55d79aae

NIR · CRIRES+ J · Ti I · Codex-graded lines · <3D> LTE (Gerber) · [1], [2], [10], [4], [6] Ti-products-98bf194ecb60

NIR · CRIRES+ J · Ti I · Codex-graded lines · <3D> NLTE (Gerber) · [1], [2], [10], [4], [6] Ti-products-26b87bec7c59

NIR · CRIRES+ J · Ti I · reference lines · 1D LTE · [1], [2], [10], [4] Ti-products-fca24e3a90aa

NIR · CRIRES+ J · Ti I · reference lines · 1D NLTE (Amarsi) · [1], [2], [10], [5] Ti-products-e151e5dc336b

NIR · CRIRES+ J · Ti I · reference lines · 1D NLTE (Gerber) · [1], [2], [10], [4] Ti-products-24a52395bbdf

NIR · CRIRES+ J · Ti I · reference lines · 1D LTE (Gerber) · [1], [2], [10], [4] Ti-products-70c436249d65

NIR · CRIRES+ J · Ti I · reference lines · <3D> LTE (Gerber) · [1], [2], [10], [4], [6] Ti-products-07cad2b0ccd2

NIR · CRIRES+ J · Ti I · reference lines · <3D> NLTE (Gerber) · [1], [2], [10], [4], [6] Ti-products-c83f37f35641

NIR · Kitt Peak (1984, molecfit) · Ti I · Codex-graded lines · 1D LTE · [1], [2], [9], [10], [4] Ti-products-c982225a9e5b

NIR · Kitt Peak (1984, molecfit) · Ti I · Codex-graded lines · 1D NLTE (Amarsi) · [1], [2], [9], [10], [5] Ti-products-292ec65f11bf

NIR · Kitt Peak (1984, molecfit) · Ti I · Codex-graded lines · 1D NLTE (Gerber) · [1], [2], [9], [10], [4] Ti-products-bab26c42a214

NIR · Kitt Peak (1984, molecfit) · Ti I · Codex-graded lines · 1D LTE (Gerber) · [1], [2], [9], [10], [4] Ti-products-4072d30f9dcb

NIR · Kitt Peak (1984, molecfit) · Ti I · Codex-graded lines · <3D> LTE (Gerber) · [1], [2], [9], [10], [4], [6] Ti-products-ac2eed84f233

NIR · Kitt Peak (1984, molecfit) · Ti I · Codex-graded lines · <3D> NLTE (Gerber) · [1], [2], [9], [10], [4], [6] Ti-products-64307ed5ab75

NIR · Kitt Peak (1984, molecfit) · Ti I · reference lines · 1D LTE · [1], [2], [9], [10], [4] Ti-products-09dcf4cc7d99

NIR · Kitt Peak (1984, molecfit) · Ti I · reference lines · 1D NLTE (Amarsi) · [1], [2], [9], [10], [5] Ti-products-38791f738f64

NIR · Kitt Peak (1984, molecfit) · Ti I · reference lines · 1D NLTE (Gerber) · [1], [2], [9], [10], [4] Ti-products-41913ab66e30

NIR · Kitt Peak (1984, molecfit) · Ti I · reference lines · 1D LTE (Gerber) · [1], [2], [9], [10], [4] Ti-products-5fd374e283c1

NIR · Kitt Peak (1984, molecfit) · Ti I · reference lines · <3D> LTE (Gerber) · [1], [2], [9], [10], [4], [6] Ti-products-cc758b3bbbab

NIR · Kitt Peak (1984, molecfit) · Ti I · reference lines · <3D> NLTE (Gerber) · [1], [2], [9], [10], [4], [6] Ti-products-b67f686e9433

VIS · HARPS · Ti I · Asplund et al. 2021 lines · 1D LTE · [1], [2], [7], [10], [8], [4] Ti-products-652a4d75c86a

VIS · HARPS · Ti I · Asplund et al. 2021 lines · 1D NLTE (Amarsi) · [1], [2], [7], [10], [8], [5] Ti-products-82f4376a9fa4

VIS · HARPS · Ti I · Asplund et al. 2021 lines · 1D NLTE (Gerber) · [1], [2], [7], [10], [8], [4] Ti-products-66009f632479

VIS · HARPS · Ti I · Asplund et al. 2021 lines · 1D LTE (Gerber) · [1], [2], [7], [10], [8], [4] Ti-products-76be698fbb53

VIS · HARPS · Ti I · Asplund et al. 2021 lines · <3D> LTE (Gerber) · [1], [2], [7], [10], [8], [4], [6] Ti-products-3018829ae260

VIS · HARPS · Ti I · Asplund et al. 2021 lines · <3D> NLTE (Gerber) · [1], [2], [7], [10], [8], [4], [6] Ti-products-f12247355d78

VIS · HARPS · Ti I · Codex-graded lines · 1D LTE · [1], [2], [10], [8], [7], [4] Ti-products-bae71cfaabb3

VIS · HARPS · Ti I · Codex-graded lines · 1D NLTE (Amarsi) · [1], [2], [10], [8], [7], [5] Ti-products-aeb67743950d

VIS · HARPS · Ti I · Codex-graded lines · 1D NLTE (Gerber) · [1], [2], [10], [8], [7], [4] Ti-products-fa47dc01a3e5

VIS · HARPS · Ti I · Codex-graded lines · 1D LTE (Gerber) · [1], [2], [10], [8], [7], [4] Ti-products-b85e388e6622

VIS · HARPS · Ti I · Codex-graded lines · <3D> LTE (Gerber) · [1], [2], [10], [8], [7], [4], [6] Ti-products-20b4eb61acc2

VIS · HARPS · Ti I · Codex-graded lines · <3D> NLTE (Gerber) · [1], [2], [10], [8], [7], [4], [6] Ti-products-ec1b3fa73be0

VIS · HARPS · Ti I · reference lines · 1D LTE · [1], [2], [10], [9], [4] Ti-products-e899f67aa095

VIS · HARPS · Ti I · reference lines · 1D NLTE (Amarsi) · [1], [2], [10], [9], [5] Ti-products-fdbafd11ad48

VIS · HARPS · Ti I · reference lines · 1D NLTE (Gerber) · [1], [2], [10], [9], [4] Ti-products-e217822e8473

VIS · HARPS · Ti I · reference lines · 1D LTE (Gerber) · [1], [2], [10], [9], [4] Ti-products-976826fbcb16

VIS · HARPS · Ti I · reference lines · <3D> LTE (Gerber) · [1], [2], [10], [9], [4], [6] Ti-products-054e7613991c

VIS · HARPS · Ti I · reference lines · <3D> NLTE (Gerber) · [1], [2], [10], [9], [4], [6] Ti-products-de52ddc63a01

VIS · Kitt Peak (Kurucz 2005) · Ti I · Asplund et al. 2021 lines · 1D LTE · [1], [2], [7], [10], [8], [4] Ti-products-67b8068d849f

VIS · Kitt Peak (Kurucz 2005) · Ti I · Asplund et al. 2021 lines · 1D NLTE (Amarsi) · [1], [2], [7], [10], [8], [5] Ti-products-0fc80a2ff233

VIS · Kitt Peak (Kurucz 2005) · Ti I · Asplund et al. 2021 lines · 1D NLTE (Gerber) · [1], [2], [7], [10], [8], [4] Ti-products-fdf126d7a98d

VIS · Kitt Peak (Kurucz 2005) · Ti I · Asplund et al. 2021 lines · 1D LTE (Gerber) · [1], [2], [7], [10], [8], [4] Ti-products-991087062edb

VIS · Kitt Peak (Kurucz 2005) · Ti I · Asplund et al. 2021 lines · <3D> LTE (Gerber) · [1], [2], [7], [10], [8], [4], [6] Ti-products-2c6b07452be0

VIS · Kitt Peak (Kurucz 2005) · Ti I · Asplund et al. 2021 lines · <3D> NLTE (Gerber) · [1], [2], [7], [10], [8], [4], [6] Ti-products-b7978d4ae897

VIS · Kitt Peak (Kurucz 2005) · Ti I · Codex-graded lines · 1D LTE · [1], [2], [10], [8], [7], [4] Ti-products-f4a90f2ba946

VIS · Kitt Peak (Kurucz 2005) · Ti I · Codex-graded lines · 1D NLTE (Amarsi) · [1], [2], [10], [8], [7], [5] Ti-products-e25c12d46176

VIS · Kitt Peak (Kurucz 2005) · Ti I · Codex-graded lines · 1D NLTE (Gerber) · [1], [2], [10], [8], [7], [4] Ti-products-e72b2f89e9b4

VIS · Kitt Peak (Kurucz 2005) · Ti I · Codex-graded lines · 1D LTE (Gerber) · [1], [2], [10], [8], [7], [4] Ti-products-58d217679c6d

VIS · Kitt Peak (Kurucz 2005) · Ti I · Codex-graded lines · <3D> LTE (Gerber) · [1], [2], [10], [8], [7], [4], [6] Ti-products-30db4de5adf6

VIS · Kitt Peak (Kurucz 2005) · Ti I · Codex-graded lines · <3D> NLTE (Gerber) · [1], [2], [10], [8], [7], [4], [6] Ti-products-e9825ebe9009

VIS · Kitt Peak (Kurucz 2005) · Ti I · reference lines · 1D LTE · [1], [2], [10], [9], [4] Ti-products-ddc928cf070b

VIS · Kitt Peak (Kurucz 2005) · Ti I · reference lines · 1D NLTE (Amarsi) · [1], [2], [10], [9], [5] Ti-products-6df1731f2e81

VIS · Kitt Peak (Kurucz 2005) · Ti I · reference lines · 1D NLTE (Gerber) · [1], [2], [10], [9], [4] Ti-products-dd41ed404199

VIS · Kitt Peak (Kurucz 2005) · Ti I · reference lines · 1D LTE (Gerber) · [1], [2], [10], [9], [4] Ti-products-2f86c68c1f41

VIS · Kitt Peak (Kurucz 2005) · Ti I · reference lines · <3D> LTE (Gerber) · [1], [2], [10], [9], [4], [6] Ti-products-234625d342d7

VIS · Kitt Peak (Kurucz 2005) · Ti I · reference lines · <3D> NLTE (Gerber) · [1], [2], [10], [9], [4], [6] Ti-products-2af8fcc16b4d

VIS · Kitt Peak (1984, molecfit) · Ti I · Asplund et al. 2021 lines · 1D LTE · [1], [2], [7], [10], [8], [4] Ti-products-f8e18c9dd888

VIS · Kitt Peak (1984, molecfit) · Ti I · Asplund et al. 2021 lines · 1D NLTE (Amarsi) · [1], [2], [7], [10], [8], [5] Ti-products-a093840af3bf

VIS · Kitt Peak (1984, molecfit) · Ti I · Asplund et al. 2021 lines · 1D NLTE (Gerber) · [1], [2], [7], [10], [8], [4] Ti-products-7d2b12420af1

VIS · Kitt Peak (1984, molecfit) · Ti I · Asplund et al. 2021 lines · 1D LTE (Gerber) · [1], [2], [7], [10], [8], [4] Ti-products-7dd5076f7740

VIS · Kitt Peak (1984, molecfit) · Ti I · Asplund et al. 2021 lines · <3D> LTE (Gerber) · [1], [2], [7], [10], [8], [4], [6] Ti-products-425bb81e17ba

VIS · Kitt Peak (1984, molecfit) · Ti I · Asplund et al. 2021 lines · <3D> NLTE (Gerber) · [1], [2], [7], [10], [8], [4], [6] Ti-products-b907a38c17f3

VIS · Kitt Peak (1984, molecfit) · Ti I · Codex-graded lines · 1D LTE · [1], [2], [10], [8], [7], [4] Ti-products-2850a4232a40

VIS · Kitt Peak (1984, molecfit) · Ti I · Codex-graded lines · 1D NLTE (Amarsi) · [1], [2], [10], [8], [7], [5] Ti-products-60a2deeb5c94

VIS · Kitt Peak (1984, molecfit) · Ti I · Codex-graded lines · 1D NLTE (Gerber) · [1], [2], [10], [8], [7], [4] Ti-products-eeb2812f7bc3

VIS · Kitt Peak (1984, molecfit) · Ti I · Codex-graded lines · 1D LTE (Gerber) · [1], [2], [10], [8], [7], [4] Ti-products-3b7eef4b728e

VIS · Kitt Peak (1984, molecfit) · Ti I · Codex-graded lines · <3D> LTE (Gerber) · [1], [2], [10], [8], [7], [4], [6] Ti-products-2d68e41ceec1

VIS · Kitt Peak (1984, molecfit) · Ti I · Codex-graded lines · <3D> NLTE (Gerber) · [1], [2], [10], [8], [7], [4], [6] Ti-products-b195a5b39855

VIS · Kitt Peak (1984, molecfit) · Ti I · reference lines · 1D LTE · [1], [2], [10], [9], [4] Ti-products-30a73b9ebe58

VIS · Kitt Peak (1984, molecfit) · Ti I · reference lines · 1D NLTE (Amarsi) · [1], [2], [10], [9], [5] Ti-products-b1eb18be5f3b

VIS · Kitt Peak (1984, molecfit) · Ti I · reference lines · 1D NLTE (Gerber) · [1], [2], [10], [9], [4] Ti-products-1a7e24fbfaba

VIS · Kitt Peak (1984, molecfit) · Ti I · reference lines · 1D LTE (Gerber) · [1], [2], [10], [9], [4] Ti-products-71c3664733e1

VIS · Kitt Peak (1984, molecfit) · Ti I · reference lines · <3D> LTE (Gerber) · [1], [2], [10], [9], [4], [6] Ti-products-9920f162bb1f

VIS · Kitt Peak (1984, molecfit) · Ti I · reference lines · <3D> NLTE (Gerber) · [1], [2], [10], [9], [4], [6] Ti-products-8f824b89a9fa

near-UV · Kitt Peak (Kurucz 2005) · Ti I · Codex-graded lines · 1D LTE · [1], [2], [8], [10], [4] Ti-products-3bc96363cdde

near-UV · Kitt Peak (Kurucz 2005) · Ti I · Codex-graded lines · 1D NLTE (Amarsi) · [1], [2], [8], [10], [5] Ti-products-22c526934fb5

near-UV · Kitt Peak (Kurucz 2005) · Ti I · Codex-graded lines · 1D NLTE (Gerber) · [1], [2], [8], [10], [4] Ti-products-9341cde9b6de

near-UV · Kitt Peak (Kurucz 2005) · Ti I · Codex-graded lines · 1D LTE (Gerber) · [1], [2], [8], [10], [4] Ti-products-9d0d35e4161a

near-UV · Kitt Peak (Kurucz 2005) · Ti I · Codex-graded lines · <3D> LTE (Gerber) · [1], [2], [8], [10], [4], [6] Ti-products-5a1085878a4c

near-UV · Kitt Peak (Kurucz 2005) · Ti I · Codex-graded lines · <3D> NLTE (Gerber) · [1], [2], [8], [10], [4], [6] Ti-products-e17f548028f2

near-UV · Kitt Peak (Kurucz 2005) · Ti I · reference lines · 1D LTE · [1], [2], [10], [4] Ti-products-250964bffa64

near-UV · Kitt Peak (Kurucz 2005) · Ti I · reference lines · 1D NLTE (Amarsi) · [1], [2], [10], [5] Ti-products-4ed05bdacec0

near-UV · Kitt Peak (Kurucz 2005) · Ti I · reference lines · 1D NLTE (Gerber) · [1], [2], [10], [4] Ti-products-dbade56d95b2

near-UV · Kitt Peak (Kurucz 2005) · Ti I · reference lines · 1D LTE (Gerber) · [1], [2], [10], [4] Ti-products-30cbc7634743

near-UV · Kitt Peak (Kurucz 2005) · Ti I · reference lines · <3D> LTE (Gerber) · [1], [2], [10], [4], [6] Ti-products-b1ed51bcbaa5

near-UV · Kitt Peak (Kurucz 2005) · Ti I · reference lines · <3D> NLTE (Gerber) · [1], [2], [10], [4], [6] Ti-products-3334d75422ec

near-UV · Kitt Peak (1984, molecfit) · Ti I · Codex-graded lines · 1D LTE · [1], [2], [8], [10], [4] Ti-products-7f448e272215

near-UV · Kitt Peak (1984, molecfit) · Ti I · Codex-graded lines · 1D NLTE (Amarsi) · [1], [2], [8], [10], [5] Ti-products-044aec1b9963

near-UV · Kitt Peak (1984, molecfit) · Ti I · Codex-graded lines · 1D NLTE (Gerber) · [1], [2], [8], [10], [4] Ti-products-96e03d2c4100

near-UV · Kitt Peak (1984, molecfit) · Ti I · Codex-graded lines · 1D LTE (Gerber) · [1], [2], [8], [10], [4] Ti-products-9b547b1273ac

near-UV · Kitt Peak (1984, molecfit) · Ti I · Codex-graded lines · <3D> LTE (Gerber) · [1], [2], [8], [10], [4], [6] Ti-products-577efeb59fb3

near-UV · Kitt Peak (1984, molecfit) · Ti I · Codex-graded lines · <3D> NLTE (Gerber) · [1], [2], [8], [10], [4], [6] Ti-products-7499dc903978

near-UV · Kitt Peak (1984, molecfit) · Ti I · reference lines · 1D LTE · [1], [2], [10], [4] Ti-products-7e57d2a7557c

near-UV · Kitt Peak (1984, molecfit) · Ti I · reference lines · 1D NLTE (Amarsi) · [1], [2], [10], [5] Ti-products-7434f35e92c9

near-UV · Kitt Peak (1984, molecfit) · Ti I · reference lines · 1D NLTE (Gerber) · [1], [2], [10], [4] Ti-products-631381231ec5

near-UV · Kitt Peak (1984, molecfit) · Ti I · reference lines · 1D LTE (Gerber) · [1], [2], [10], [4] Ti-products-3c40db17257b

near-UV · Kitt Peak (1984, molecfit) · Ti I · reference lines · <3D> LTE (Gerber) · [1], [2], [10], [4], [6] Ti-products-bed8eb4ddaff

near-UV · Kitt Peak (1984, molecfit) · Ti I · reference lines · <3D> NLTE (Gerber) · [1], [2], [10], [4], [6] Ti-products-a59fb9924c7b

red-optical · IAG FTS · Ti I · Asplund et al. 2021 lines · 1D LTE · [1], [2], [7], [10], [9], [4] Ti-products-4699a98bd155

red-optical · IAG FTS · Ti I · Asplund et al. 2021 lines · 1D NLTE (Amarsi) · [1], [2], [7], [10], [9], [5] Ti-products-c9cd08d584b7

red-optical · IAG FTS · Ti I · Asplund et al. 2021 lines · 1D NLTE (Gerber) · [1], [2], [7], [10], [9], [4] Ti-products-760d85040d7c

red-optical · IAG FTS · Ti I · Asplund et al. 2021 lines · 1D LTE (Gerber) · [1], [2], [7], [10], [9], [4] Ti-products-81ed196aef9c

red-optical · IAG FTS · Ti I · Asplund et al. 2021 lines · <3D> LTE (Gerber) · [1], [2], [7], [10], [9], [4], [6] Ti-products-dd59ebd9a0c4

red-optical · IAG FTS · Ti I · Asplund et al. 2021 lines · <3D> NLTE (Gerber) · [1], [2], [7], [10], [9], [4], [6] Ti-products-c35d1db9135f

red-optical · IAG FTS · Ti I · Codex-graded lines · 1D LTE · [1], [2], [10], [9], [8], [7], [4] Ti-products-3645251c09f3

red-optical · IAG FTS · Ti I · Codex-graded lines · 1D NLTE (Amarsi) · [1], [2], [10], [8], [9], [7], [5] Ti-products-3b0cded89118

red-optical · IAG FTS · Ti I · Codex-graded lines · 1D NLTE (Gerber) · [1], [2], [10], [9], [8], [7], [4] Ti-products-b16cbe59d112

red-optical · IAG FTS · Ti I · Codex-graded lines · 1D LTE (Gerber) · [1], [2], [10], [9], [8], [7], [4] Ti-products-20fc30c73052

red-optical · IAG FTS · Ti I · Codex-graded lines · <3D> LTE (Gerber) · [1], [2], [10], [9], [8], [7], [4], [6] Ti-products-b6b139a9a49b

red-optical · IAG FTS · Ti I · Codex-graded lines · <3D> NLTE (Gerber) · [1], [2], [10], [9], [8], [7], [4], [6] Ti-products-381e06b54eae

red-optical · IAG FTS · Ti I · reference lines · 1D LTE · [1], [2], [10], [9], [4] Ti-products-5fc7ba06ec3a

red-optical · IAG FTS · Ti I · reference lines · 1D NLTE (Amarsi) · [1], [2], [10], [9], [5] Ti-products-18e1dbd5a952

red-optical · IAG FTS · Ti I · reference lines · 1D NLTE (Gerber) · [1], [2], [10], [9], [4] Ti-products-d9d029438bfd

red-optical · IAG FTS · Ti I · reference lines · 1D LTE (Gerber) · [1], [2], [10], [9], [4] Ti-products-7cfc844660b6

red-optical · IAG FTS · Ti I · reference lines · <3D> LTE (Gerber) · [1], [2], [10], [9], [4], [6] Ti-products-40c3f94ee256

red-optical · IAG FTS · Ti I · reference lines · <3D> NLTE (Gerber) · [1], [2], [10], [9], [4], [6] Ti-products-276d48755b02

red-optical · Kitt Peak (Kurucz 2005) · Ti I · Asplund et al. 2021 lines · 1D LTE · [1], [2], [7], [10], [9], [4] Ti-products-5e580b164a26

red-optical · Kitt Peak (Kurucz 2005) · Ti I · Asplund et al. 2021 lines · 1D NLTE (Amarsi) · [1], [2], [7], [10], [9], [5] Ti-products-06cd885254c1

red-optical · Kitt Peak (Kurucz 2005) · Ti I · Asplund et al. 2021 lines · 1D NLTE (Gerber) · [1], [2], [7], [10], [9], [4] Ti-products-852007ffc5da

red-optical · Kitt Peak (Kurucz 2005) · Ti I · Asplund et al. 2021 lines · 1D LTE (Gerber) · [1], [2], [7], [10], [9], [4] Ti-products-8e4060815151

red-optical · Kitt Peak (Kurucz 2005) · Ti I · Asplund et al. 2021 lines · <3D> LTE (Gerber) · [1], [2], [7], [10], [9], [4], [6] Ti-products-b16cfe4fdfcc

red-optical · Kitt Peak (Kurucz 2005) · Ti I · Asplund et al. 2021 lines · <3D> NLTE (Gerber) · [1], [2], [7], [10], [9], [4], [6] Ti-products-896ecf1b4a65

red-optical · Kitt Peak (Kurucz 2005) · Ti I · Codex-graded lines · 1D LTE · [1], [2], [10], [9], [8], [7], [4] Ti-products-e9b7585fbf21

red-optical · Kitt Peak (Kurucz 2005) · Ti I · Codex-graded lines · 1D NLTE (Amarsi) · [1], [2], [10], [9], [8], [7], [5] Ti-products-321b73535273

red-optical · Kitt Peak (Kurucz 2005) · Ti I · Codex-graded lines · 1D NLTE (Gerber) · [1], [2], [10], [9], [8], [7], [4] Ti-products-dc2319f0e731

red-optical · Kitt Peak (Kurucz 2005) · Ti I · Codex-graded lines · 1D LTE (Gerber) · [1], [2], [10], [9], [8], [7], [4] Ti-products-88fb499f7011

red-optical · Kitt Peak (Kurucz 2005) · Ti I · Codex-graded lines · <3D> LTE (Gerber) · [1], [2], [10], [9], [8], [7], [4], [6] Ti-products-b0a4a07e2231

red-optical · Kitt Peak (Kurucz 2005) · Ti I · Codex-graded lines · <3D> NLTE (Gerber) · [1], [2], [10], [9], [8], [7], [4], [6] Ti-products-7c46162f910a

red-optical · Kitt Peak (Kurucz 2005) · Ti I · reference lines · 1D LTE · [1], [2], [10], [9], [4] Ti-products-bb57291aaaf0

red-optical · Kitt Peak (Kurucz 2005) · Ti I · reference lines · 1D NLTE (Amarsi) · [1], [2], [10], [9], [5] Ti-products-dd712efea25c

red-optical · Kitt Peak (Kurucz 2005) · Ti I · reference lines · 1D NLTE (Gerber) · [1], [2], [10], [9], [4] Ti-products-a20d0d99d48f

red-optical · Kitt Peak (Kurucz 2005) · Ti I · reference lines · 1D LTE (Gerber) · [1], [2], [10], [9], [4] Ti-products-92cf7db59fcc

red-optical · Kitt Peak (Kurucz 2005) · Ti I · reference lines · <3D> LTE (Gerber) · [1], [2], [10], [9], [4], [6] Ti-products-7ad3a75c11a8

red-optical · Kitt Peak (Kurucz 2005) · Ti I · reference lines · <3D> NLTE (Gerber) · [1], [2], [10], [9], [4], [6] Ti-products-7ecb6c098d05

red-optical · Kitt Peak (1984, molecfit) · Ti I · Asplund et al. 2021 lines · 1D LTE · [1], [2], [7], [10], [9], [4] Ti-products-323631e55c30

red-optical · Kitt Peak (1984, molecfit) · Ti I · Asplund et al. 2021 lines · 1D NLTE (Amarsi) · [1], [2], [7], [10], [9], [5] Ti-products-3380bef7f5d7

red-optical · Kitt Peak (1984, molecfit) · Ti I · Asplund et al. 2021 lines · 1D NLTE (Gerber) · [1], [2], [7], [10], [9], [4] Ti-products-c5a90e19127f

red-optical · Kitt Peak (1984, molecfit) · Ti I · Asplund et al. 2021 lines · 1D LTE (Gerber) · [1], [2], [7], [10], [9], [4] Ti-products-09798c732c9e

red-optical · Kitt Peak (1984, molecfit) · Ti I · Asplund et al. 2021 lines · <3D> LTE (Gerber) · [1], [2], [7], [10], [9], [4], [6] Ti-products-272d7d9ca12c

red-optical · Kitt Peak (1984, molecfit) · Ti I · Asplund et al. 2021 lines · <3D> NLTE (Gerber) · [1], [2], [7], [10], [9], [4], [6] Ti-products-f9b49d43975e

red-optical · Kitt Peak (1984, molecfit) · Ti I · Codex-graded lines · 1D LTE · [1], [2], [10], [9], [8], [7], [4] Ti-products-70ec026db7f0

red-optical · Kitt Peak (1984, molecfit) · Ti I · Codex-graded lines · 1D NLTE (Amarsi) · [1], [2], [10], [8], [9], [7], [5] Ti-products-6249349abc60

red-optical · Kitt Peak (1984, molecfit) · Ti I · Codex-graded lines · 1D NLTE (Gerber) · [1], [2], [10], [9], [8], [7], [4] Ti-products-e72930d2cdc5

red-optical · Kitt Peak (1984, molecfit) · Ti I · Codex-graded lines · 1D LTE (Gerber) · [1], [2], [10], [9], [8], [7], [4] Ti-products-a5d5cb9308a9

red-optical · Kitt Peak (1984, molecfit) · Ti I · Codex-graded lines · <3D> LTE (Gerber) · [1], [2], [10], [9], [8], [7], [4], [6] Ti-products-79cc2a12cc81

red-optical · Kitt Peak (1984, molecfit) · Ti I · Codex-graded lines · <3D> NLTE (Gerber) · [1], [2], [10], [9], [8], [7], [4], [6] Ti-products-d3184cb11dd2

red-optical · Kitt Peak (1984, molecfit) · Ti I · reference lines · 1D LTE · [1], [2], [10], [9], [4] Ti-products-5b710ff0d2c0

red-optical · Kitt Peak (1984, molecfit) · Ti I · reference lines · 1D NLTE (Amarsi) · [1], [2], [10], [9], [5] Ti-products-05d6b9e7d460

red-optical · Kitt Peak (1984, molecfit) · Ti I · reference lines · 1D NLTE (Gerber) · [1], [2], [10], [9], [4] Ti-products-817c0696a2e6

red-optical · Kitt Peak (1984, molecfit) · Ti I · reference lines · 1D LTE (Gerber) · [1], [2], [10], [9], [4] Ti-products-c300635d033b

red-optical · Kitt Peak (1984, molecfit) · Ti I · reference lines · <3D> LTE (Gerber) · [1], [2], [10], [9], [4], [6] Ti-products-0203a5f9609c

red-optical · Kitt Peak (1984, molecfit) · Ti I · reference lines · <3D> NLTE (Gerber) · [1], [2], [10], [9], [4], [6] Ti-products-96d742815aa9

Complete applicable bibliography

Solar abundance and indicator analyses

[1] — Asplund, M.; Amarsi, A. M.; Grevesse, N. (2021). The chemical make-up of the Sun: A 2020 vision. A&A 653, A141 DOI: 10.1051/0004-6361/202140445. source record

[2] — Lodders, K.; Bergemann, M.; Palme, H. (2025). Solar System Elemental Abundances from the Solar Photosphere and CI-Chondrites. Space Science Reviews 221 DOI: 10.1007/s11214-025-01146-w. source record

[7] — Scott, P.; Asplund, M.; Grevesse, N.; Bergemann, M.; Sauval, A. J. (2015). The elemental composition of the Sun. II. The iron group elements Sc to Ni. A&A 573, A26 DOI: 10.1051/0004-6361/201424110. source record

Atomic data and gf authorities

[3] — Wood, M. P.; Lawler, J. E.; Sneden, C.; Cowan, J. J. (2013). Improved Ti II log(gf) Values and Abundance Determinations in the Photospheres of the Sun and Metal-poor Star HD 84937. ApJS 208, 27 DOI: 10.1088/0067-0049/208/2/27. source record

[8] — Kramida, A.; Ralchenko, Yu.; Reader, J.; NIST ASD Team (2024). NIST Atomic Spectra Database (version 5.11/5.12). National Institute of Standards and Technology, Gaithersburg, MD DOI: 10.18434/T4W30F. source record

[9] — Blackwell-Whitehead, R. J.; Lundberg, H.; Nave, G.; Pickering, J. C.; et al. (2006). Experimental Ti I oscillator strengths and their application to cool star analysis. MNRAS 373, 1603 DOI: 10.1111/j.1365-2966.2006.11161.x. source record

[10] — Lawler, J. E.; Guzman, A.; Wood, M. P.; Sneden, C.; Cowan, J. J. (2013). Improved log(gf) Values for Lines of Ti I and Abundance Determinations in the Photospheres of the Sun and Metal-poor Star HD 84937. ApJS 205, 11 DOI: 10.1088/0067-0049/205/2/11. source record

Model and grid sources

[4] — Gerber, J. M.; Magg, E.; Plez, B.; Bergemann, M.; Heiter, U.; Olander, T.; Hoppe, R. (2023). Non-LTE radiative transfer with Turbospectrum. A&A 669, A43 DOI: 10.1051/0004-6361/202243673. source record

[5] — Mallinson, J. W. E.; Lind, K.; Amarsi, A. M.; Youakim, K. (2024). Titanium abundances in late-type stars. II. Grid of departure coefficients and application to a sample of 70 000 stars. A&A 687, A5 DOI: 10.1051/0004-6361/202347698. source record

[6] — Magic, Z.; Collet, R.; Hayek, W.; Asplund, M. (2013). The Stagger-grid: A grid of 3D stellar atmosphere models. II. Horizontal and temporal averaging and spectral line formation. A&A 560, A8 DOI: 10.1051/0004-6361/201322252. source record