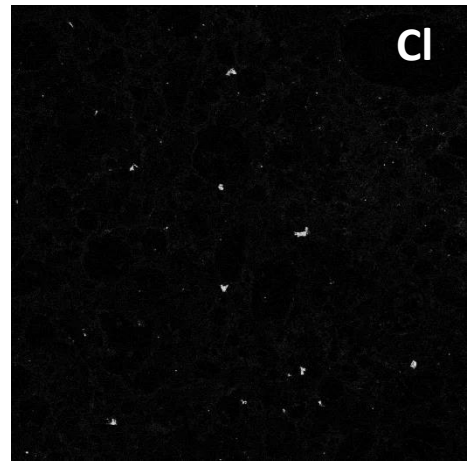
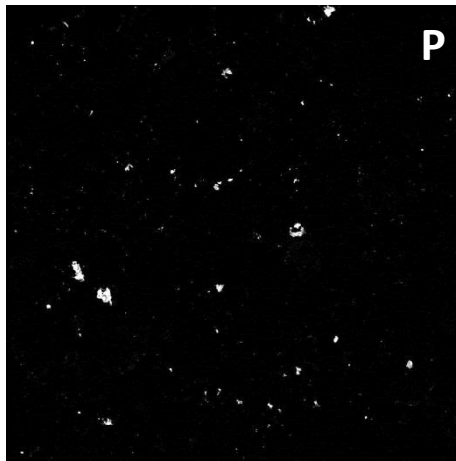
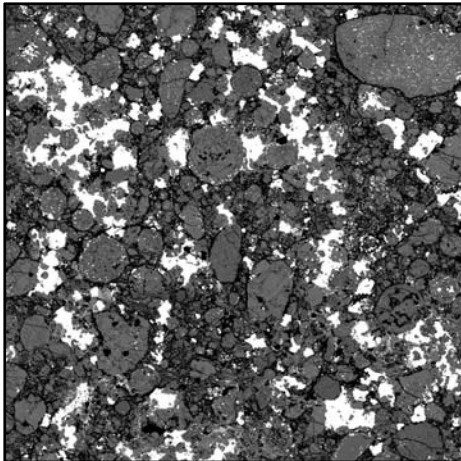


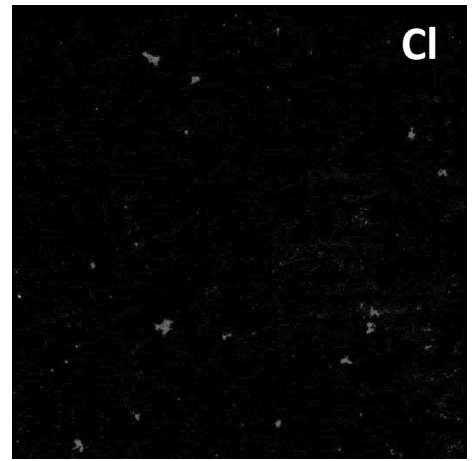
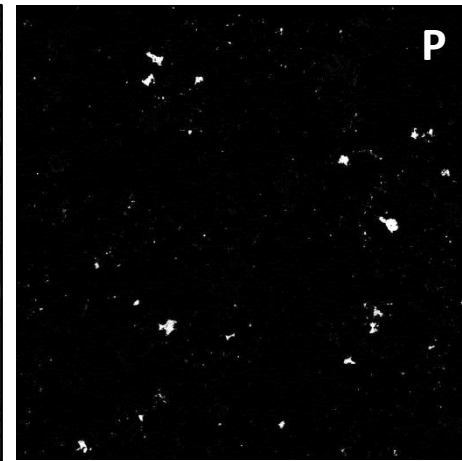
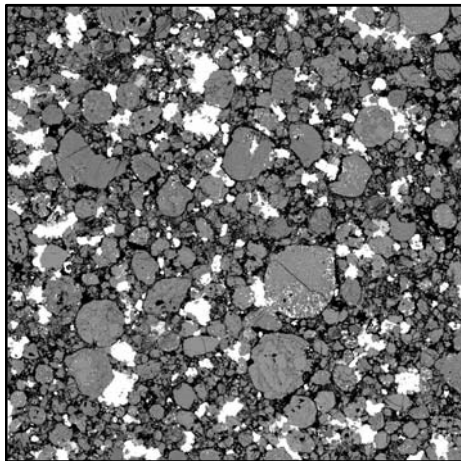
Avanhandava

8 mm x 8 mm



Richardton

8 mm x 8 mm



Estacado

7 mm x 10.5 mm

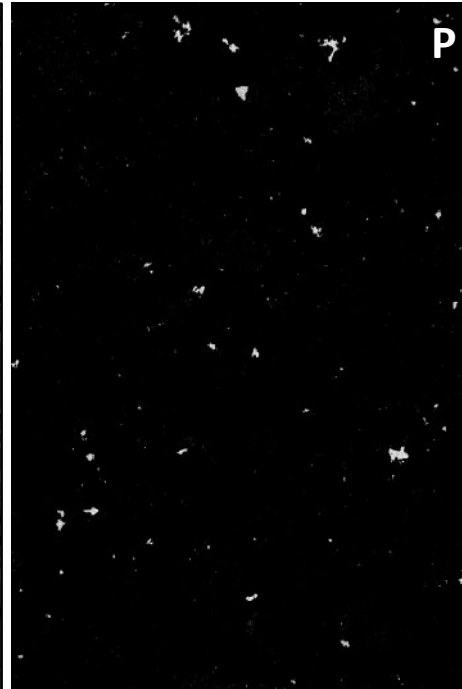
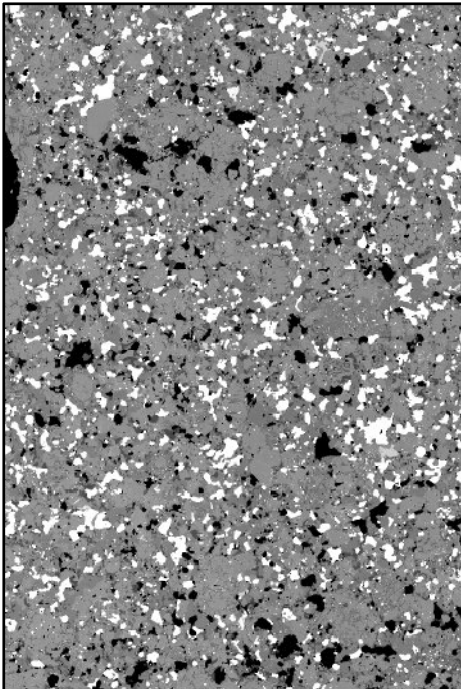


Fig. EA1

## Oro Grande

8 mm x 12 mm

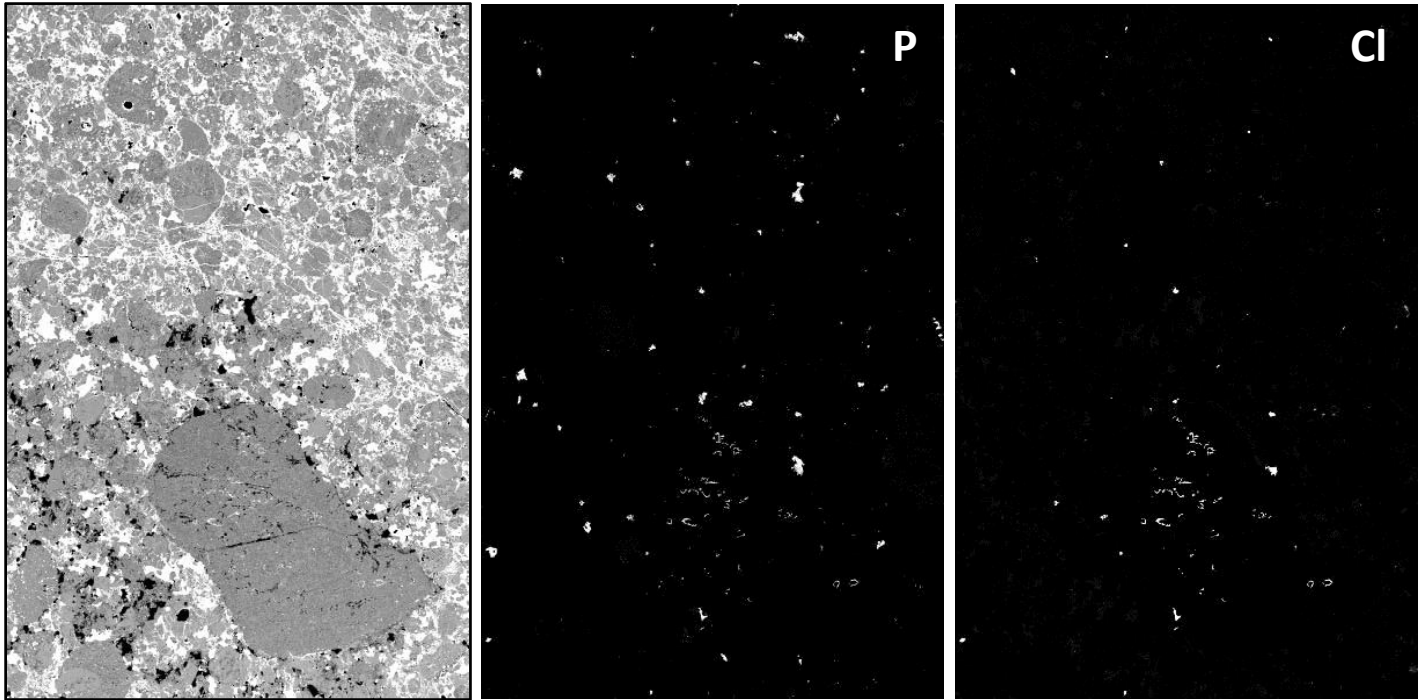


Fig. EA1. Distribution of phosphate grains in H chondrites including, for each chondrite, a BSE map, and P and Cl WDS X-ray maps. Modal abundances of apatite were determined from Cl X-ray maps, and abundances of merrillite were obtained by subtracting apatite abundances from the modal abundance of P-bearing phases. The Oro Grande map includes the large igneous inclusion described in the text.

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**Table EA-1: EPMA analyses of merrillite**

| Analysis    | Grain | Formula on the basis of 56 oxygens |      |      |      |       |        |        |       |       |       |        |        |
|-------------|-------|------------------------------------|------|------|------|-------|--------|--------|-------|-------|-------|--------|--------|
|             |       | CaO                                | MgO  | FeO  | Na2O | P2O5  | Total  | Ca     | Mg    | Fe    | Na    | P      | Total  |
| AVANHANDAVA |       |                                    |      |      |      |       |        |        |       |       |       |        |        |
| Avan-6      |       | 46.86                              | 3.72 | 0.47 | 2.82 | 45.49 | 99.43  | 18.116 | 1.998 | 0.141 | 1.969 | 13.895 | 36.139 |
| Avan-7      |       | 46.84                              | 3.64 | 0.44 | 2.75 | 45.28 | 99.02  | 18.183 | 1.968 | 0.132 | 1.929 | 13.891 | 36.119 |
| Avan-8      |       | 46.93                              | 3.78 | 0.55 | 2.85 | 45.50 | 99.65  | 18.112 | 2.027 | 0.165 | 1.992 | 13.874 | 36.180 |
| Avanmer1-1  |       | 46.95                              | 3.84 | 0.45 | 2.75 | 45.27 | 99.29  | 18.184 | 2.069 | 0.137 | 1.924 | 13.855 | 36.178 |
| Avanmer1-2  |       | 47.23                              | 3.67 | 0.38 | 2.75 | 45.97 | 100.10 | 18.117 | 1.960 | 0.115 | 1.908 | 13.934 | 36.048 |
| Avanmer1-3  |       | 47.17                              | 3.71 | 0.44 | 2.79 | 45.40 | 99.57  | 18.223 | 1.996 | 0.134 | 1.950 | 13.861 | 36.177 |
| Avanmer1-4  |       | 47.30                              | 3.69 | 0.44 | 2.79 | 45.58 | 99.83  | 18.221 | 1.978 | 0.132 | 1.943 | 13.875 | 36.159 |
| Avanmer1-5  |       | 47.18                              | 3.64 | 0.32 | 2.81 | 45.52 | 99.53  | 18.220 | 1.956 | 0.095 | 1.960 | 13.892 | 36.135 |
| Avanmer1-6  |       | 47.08                              | 3.71 | 0.35 | 2.78 | 45.34 | 99.32  | 18.228 | 1.996 | 0.104 | 1.944 | 13.873 | 36.161 |
| Avanmer1-7  |       | 46.97                              | 3.70 | 0.31 | 2.75 | 45.59 | 99.37  | 18.149 | 1.987 | 0.092 | 1.922 | 13.918 | 36.081 |
| Avanmer2-1  |       | 47.32                              | 3.65 | 0.38 | 2.77 | 45.36 | 99.57  | 18.291 | 1.961 | 0.114 | 1.934 | 13.855 | 36.176 |
| Avanmer2-2  |       | 47.18                              | 3.65 | 0.32 | 2.77 | 45.60 | 99.59  | 18.204 | 1.960 | 0.096 | 1.931 | 13.903 | 36.108 |
| Avanmer2-3  |       | 47.03                              | 3.69 | 0.59 | 2.80 | 45.40 | 99.56  | 18.180 | 1.983 | 0.177 | 1.957 | 13.866 | 36.174 |
| Avanmer2-4  |       | 46.84                              | 3.65 | 0.35 | 2.75 | 45.70 | 99.48  | 18.080 | 1.958 | 0.105 | 1.919 | 13.939 | 36.038 |
| Avanmer2-5  |       | 47.15                              | 3.65 | 0.44 | 2.71 | 45.32 | 99.45  | 18.251 | 1.964 | 0.132 | 1.896 | 13.864 | 36.139 |
| Average     |       | 47.07                              | 3.69 | 0.41 | 2.77 | 45.49 | 99.52  | 18.18  | 1.98  | 0.12  | 1.94  | 13.89  | 36.13  |
| 1-sigma     |       | 0.16                               | 0.06 | 0.08 | 0.04 | 0.19  | 0.25   | 0.06   | 0.03  | 0.02  | 0.02  | 0.03   | 0.05   |
| RICHARDTON  |       |                                    |      |      |      |       |        |        |       |       |       |        |        |
| RichAp2-3   |       | 47.08                              | 3.66 | 0.50 | 2.83 | 45.16 | 99.28  | 18.265 | 1.977 | 0.150 | 1.989 | 13.842 | 36.236 |
| RichAp2-4   |       | 47.10                              | 3.62 | 0.44 | 2.72 | 46.01 | 99.97  | 18.079 | 1.933 | 0.131 | 1.891 | 13.957 | 36.008 |
| RichAp2-5   |       | 47.00                              | 3.72 | 0.48 | 2.74 | 45.90 | 99.89  | 18.061 | 1.987 | 0.144 | 1.903 | 13.937 | 36.046 |
| RichAp2-6   |       | 46.67                              | 3.79 | 0.51 | 2.78 | 44.94 | 98.74  | 18.192 | 2.054 | 0.155 | 1.958 | 13.842 | 36.217 |
| RichMe1-1   |       | 47.14                              | 3.68 | 0.27 | 2.80 | 45.15 | 99.08  | 18.302 | 1.990 | 0.083 | 1.969 | 13.852 | 36.206 |
| RichMe1-2   |       | 47.18                              | 3.68 | 0.29 | 2.82 | 45.48 | 99.47  | 18.231 | 1.979 | 0.087 | 1.969 | 13.884 | 36.157 |
| RichMe1-3   |       | 47.19                              | 3.69 | 0.33 | 2.83 | 45.09 | 99.19  | 18.319 | 1.992 | 0.101 | 1.991 | 13.832 | 36.244 |
| RichMe1-4   |       | 47.22                              | 3.68 | 0.53 | 2.80 | 45.40 | 99.76  | 18.218 | 1.973 | 0.159 | 1.955 | 13.841 | 36.177 |
| RichMe1-5   |       | 47.10                              | 3.65 | 0.30 | 2.79 | 44.75 | 98.63  | 18.398 | 1.982 | 0.090 | 1.970 | 13.812 | 36.263 |
| RichMe2-1   |       | 46.89                              | 3.68 | 0.34 | 2.82 | 44.97 | 98.71  | 18.276 | 1.997 | 0.104 | 1.990 | 13.851 | 36.226 |
| RichMe2-2   |       | 47.02                              | 3.64 | 0.29 | 2.86 | 45.30 | 99.17  | 18.232 | 1.964 | 0.088 | 2.009 | 13.880 | 36.192 |
| RichMe2-3   |       | 47.14                              | 3.67 | 0.34 | 2.77 | 44.91 | 98.85  | 18.360 | 1.991 | 0.103 | 1.953 | 13.825 | 36.238 |
| RichMe3-1   |       | 47.37                              | 3.69 | 0.36 | 2.85 | 45.65 | 100.00 | 18.217 | 1.974 | 0.108 | 1.982 | 13.872 | 36.171 |
| RichMe3-2   |       | 47.39                              | 3.67 | 0.40 | 2.82 | 45.19 | 99.48  | 18.349 | 1.978 | 0.121 | 1.976 | 13.825 | 36.251 |
| RichMe3-3   |       | 47.29                              | 3.70 | 0.46 | 2.83 | 45.42 | 99.79  | 18.247 | 1.987 | 0.140 | 1.973 | 13.847 | 36.211 |
| RichMe3-4   |       | 46.99                              | 3.66 | 0.69 | 2.78 | 45.06 | 99.24  | 18.249 | 1.977 | 0.210 | 1.951 | 13.829 | 36.229 |
| RichMe3-5   |       | 47.17                              | 3.63 | 0.67 | 2.85 | 45.24 | 99.60  | 18.254 | 1.953 | 0.201 | 1.998 | 13.834 | 36.248 |
| RichAp5-4   |       | 47.34                              | 3.67 | 0.52 | 2.78 | 45.25 | 99.62  | 18.312 | 1.975 | 0.158 | 1.943 | 13.829 | 36.251 |
| RichAp6-5   |       | 46.67                              | 3.64 | 0.91 | 2.74 | 45.15 | 99.14  | 18.135 | 1.965 | 0.277 | 1.926 | 13.862 | 36.174 |
| Average     |       | 47.10                              | 3.67 | 0.45 | 2.80 | 45.26 | 99.35  | 18.25  | 1.98  | 0.14  | 1.96  | 13.86  | 36.20  |
| 1-sigma     |       | 0.20                               | 0.04 | 0.17 | 0.04 | 0.32  | 0.43   | 0.09   | 0.02  | 0.05  | 0.03  | 0.04   | 0.07   |
| ORO GRANDE  |       |                                    |      |      |      |       |        |        |       |       |       |        |        |
| OroMer1-1   |       | 46.91                              | 3.70 | 0.36 | 2.69 | 45.27 | 98.97  | 18.210 | 1.999 | 0.108 | 1.887 | 13.888 | 36.101 |
| OroMer1-2   |       | 47.00                              | 3.63 | 0.34 | 2.79 | 45.30 | 99.16  | 18.227 | 1.958 | 0.103 | 1.959 | 13.880 | 36.149 |
| OroMer1-3   |       | 47.11                              | 3.70 | 0.28 | 2.78 | 45.03 | 98.94  | 18.321 | 2.000 | 0.085 | 1.954 | 13.839 | 36.211 |
| OroMer1-4   |       | 47.17                              | 3.67 | 0.36 | 2.75 | 45.55 | 99.58  | 18.205 | 1.971 | 0.108 | 1.923 | 13.893 | 36.115 |
| OroMer1-5   |       | 47.27                              | 3.65 | 0.33 | 2.77 | 45.74 | 99.83  | 18.190 | 1.956 | 0.099 | 1.926 | 13.910 | 36.092 |
| OroMer1-6   |       | 47.02                              | 3.69 | 0.45 | 2.72 | 44.95 | 98.87  | 18.312 | 2.001 | 0.136 | 1.915 | 13.832 | 36.206 |
| OroMer1-7   |       | 47.01                              | 3.68 | 0.34 | 2.74 | 45.20 | 99.05  | 18.253 | 1.985 | 0.103 | 1.921 | 13.867 | 36.149 |
| OroMer1-8   |       | 47.11                              | 3.63 | 0.35 | 2.72 | 44.78 | 98.63  | 18.399 | 1.971 | 0.108 | 1.920 | 13.818 | 36.225 |
| OroMer1-9   |       | 46.95                              | 3.75 | 0.43 | 2.73 | 45.23 | 99.13  | 18.212 | 2.025 | 0.129 | 1.919 | 13.864 | 36.155 |
| OroAp1-3    |       | 47.04                              | 3.65 | 0.31 | 2.76 | 45.23 | 99.06  | 18.262 | 1.969 | 0.092 | 1.939 | 13.877 | 36.150 |
| OroAp1-4    |       | 47.00                              | 3.66 | 0.46 | 2.67 | 45.24 | 99.06  | 18.247 | 1.975 | 0.139 | 1.878 | 13.877 | 36.121 |
| OroAp2-1    |       | 47.08                              | 3.73 | 0.67 | 2.76 | 45.18 | 99.46  | 18.237 | 2.010 | 0.203 | 1.931 | 13.829 | 36.217 |
| OroAp2-2    |       | 47.06                              | 3.71 | 0.65 | 2.73 | 44.74 | 98.93  | 18.353 | 2.012 | 0.198 | 1.926 | 13.786 | 36.282 |
| OroAp2-3    |       | 47.06                              | 3.69 | 0.50 | 2.72 | 44.80 | 98.83  | 18.356 | 2.004 | 0.151 | 1.921 | 13.806 | 36.247 |
| OroAp2-4    |       | 47.02                              | 3.71 | 0.45 | 2.77 | 44.90 | 98.86  | 18.317 | 2.011 | 0.136 | 1.951 | 13.822 | 36.240 |
| OroMe2-1    |       | 47.19                              | 3.62 | 0.38 | 2.72 | 45.02 | 98.93  | 18.362 | 1.960 | 0.115 | 1.912 | 13.843 | 36.196 |
| OroMe2-2    |       | 47.11                              | 3.65 | 0.36 | 2.70 | 45.11 | 98.92  | 18.317 | 1.975 | 0.110 | 1.897 | 13.860 | 36.159 |
| OroMe2-3    |       | 46.95                              | 3.69 | 0.41 | 2.77 | 45.03 | 98.83  | 18.277 | 1.996 | 0.123 | 1.949 | 13.852 | 36.196 |
| OroMe2-4    |       | 47.10                              | 3.64 | 0.35 | 2.67 | 44.35 | 98.13  | 18.512 | 1.989 | 0.108 | 1.898 | 13.775 | 36.285 |
| OroMe3-1    |       | 47.18                              | 3.77 | 0.46 | 2.84 | 44.83 | 99.17  | 18.352 | 2.041 | 0.139 | 1.998 | 13.779 | 36.322 |
| Average     |       | 47.07                              | 3.68 | 0.41 | 2.74 | 45.07 | 99.02  | 18.30  | 1.99  | 0.12  | 1.93  | 13.84  | 36.19  |
| 1-sigma     |       | 0.09                               | 0.04 | 0.10 | 0.04 | 0.31  | 0.35   | 0.08   | 0.02  | 0.03  | 0.03  | 0.04   | 0.06   |
| ESTACADO    |       |                                    |      |      |      |       |        |        |       |       |       |        |        |
| estacado-2  |       | 46.62                              | 3.57 | 0.35 | 2.86 | 45.61 | 99.10  | 18.056 | 1.922 | 0.106 | 2.003 | 13.957 | 36.059 |
| estacado-4  |       | 46.27                              | 3.45 | 0.68 | 2.77 | 45.02 | 98.27  | 18.108 | 1.878 | 0.209 | 1.958 | 13.921 | 36.090 |
| estacado-5  |       | 46.89                              | 3.61 | 0.26 | 2.86 | 45.34 | 99.02  | 18.195 | 1.948 | 0.079 | 2.007 | 13.904 | 36.146 |
| estacado-10 |       | 46.80                              | 3.51 | 0.59 | 2.78 | 45.09 | 98.86  | 18.226 | 1.902 | 0.178 | 1.960 | 13.876 | 36.160 |

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|             |  |       |      |      |      |       |        |        |       |       |       |        |        |
|-------------|--|-------|------|------|------|-------|--------|--------|-------|-------|-------|--------|--------|
| estacado-11 |  | 46.92 | 3.55 | 0.33 | 2.76 | 45.33 | 99.04  | 18.213 | 1.918 | 0.101 | 1.942 | 13.905 | 36.117 |
| estacado-14 |  | 46.42 | 3.57 | 0.70 | 2.76 | 44.80 | 98.38  | 18.177 | 1.947 | 0.213 | 1.955 | 13.863 | 36.206 |
| estacado-21 |  | 46.89 | 3.48 | 1.03 | 2.85 | 45.92 | 100.20 | 18.004 | 1.859 | 0.308 | 1.981 | 13.931 | 36.090 |
| estacado-24 |  | 46.10 | 3.44 | 0.97 | 2.85 | 45.34 | 98.82  | 17.943 | 1.864 | 0.295 | 2.006 | 13.946 | 36.111 |
| estacado-26 |  | 46.94 | 3.56 | 0.36 | 2.78 | 45.31 | 99.03  | 18.218 | 1.922 | 0.108 | 1.949 | 13.898 | 36.117 |
| estacado-31 |  | 46.93 | 3.52 | 0.46 | 2.73 | 45.72 | 99.48  | 18.116 | 1.892 | 0.138 | 1.908 | 13.948 | 36.032 |
| estacado-32 |  | 47.15 | 3.51 | 0.31 | 2.82 | 45.65 | 99.47  | 18.206 | 1.887 | 0.094 | 1.967 | 13.929 | 36.088 |
| estacado-38 |  | 47.17 | 3.48 | 0.35 | 2.74 | 45.66 | 99.45  | 18.220 | 1.869 | 0.104 | 1.913 | 13.936 | 36.054 |
| estacado-39 |  | 46.97 | 3.62 | 0.52 | 2.76 | 45.93 | 99.91  | 18.051 | 1.933 | 0.157 | 1.922 | 13.946 | 36.029 |
| estacado-40 |  | 47.15 | 3.51 | 0.31 | 2.77 | 45.55 | 99.32  | 18.237 | 1.890 | 0.093 | 1.936 | 13.922 | 36.084 |
| estacado-41 |  | 46.88 | 3.56 | 0.29 | 2.79 | 45.79 | 99.44  | 18.086 | 1.911 | 0.086 | 1.949 | 13.959 | 36.019 |
| estacado-42 |  | 46.71 | 3.54 | 0.43 | 2.82 | 45.92 | 99.53  | 17.998 | 1.899 | 0.129 | 1.965 | 13.983 | 35.999 |
| estacado-53 |  | 47.05 | 3.53 | 0.26 | 2.77 | 45.81 | 99.43  | 18.149 | 1.895 | 0.078 | 1.935 | 13.963 | 36.023 |
| estacado-61 |  | 47.02 | 3.52 | 0.27 | 2.76 | 45.92 | 99.52  | 18.112 | 1.888 | 0.082 | 1.925 | 13.977 | 35.993 |
| estacado-62 |  | 47.04 | 3.51 | 0.26 | 2.77 | 46.15 | 99.79  | 18.060 | 1.874 | 0.079 | 1.925 | 14.000 | 35.949 |
| estacado-63 |  | 47.13 | 3.54 | 0.36 | 2.78 | 45.91 | 99.83  | 18.120 | 1.893 | 0.108 | 1.931 | 13.948 | 36.029 |
| estacado-64 |  | 45.80 | 3.47 | 1.60 | 2.75 | 44.58 | 98.28  | 17.998 | 1.897 | 0.492 | 1.953 | 13.844 | 36.200 |
| estacado-65 |  | 47.22 | 3.52 | 0.46 | 2.77 | 46.09 | 100.11 | 18.101 | 1.877 | 0.139 | 1.920 | 13.962 | 36.010 |
| estacado-66 |  | 46.66 | 3.60 | 0.59 | 2.75 | 45.77 | 99.43  | 18.013 | 1.932 | 0.179 | 1.919 | 13.961 | 36.022 |
| estacado-67 |  | 47.14 | 3.52 | 0.34 | 2.77 | 45.84 | 99.69  | 18.152 | 1.887 | 0.102 | 1.930 | 13.948 | 36.037 |
| estacado-68 |  | 47.22 | 3.56 | 0.35 | 2.79 | 45.72 | 99.72  | 18.192 | 1.906 | 0.104 | 1.945 | 13.917 | 36.087 |
| estacado-69 |  | 46.91 | 3.51 | 0.87 | 2.69 | 45.38 | 99.46  | 18.156 | 1.891 | 0.262 | 1.884 | 13.879 | 36.098 |
| estacado-70 |  | 46.99 | 3.57 | 0.48 | 2.74 | 45.67 | 99.52  | 18.135 | 1.915 | 0.145 | 1.914 | 13.928 | 36.052 |
| estacado-71 |  | 46.87 | 3.56 | 0.56 | 2.78 | 45.43 | 99.25  | 18.153 | 1.920 | 0.169 | 1.950 | 13.905 | 36.107 |

|         |  |       |      |      |      |       |       |       |      |      |      |       |       |
|---------|--|-------|------|------|------|-------|-------|-------|------|------|------|-------|-------|
| Average |  | 46.85 | 3.53 | 0.51 | 2.78 | 45.58 | 99.33 | 18.12 | 1.90 | 0.15 | 1.94 | 13.93 | 36.07 |
| 1-sigma |  | 0.34  | 0.04 | 0.30 | 0.04 | 0.38  | 0.49  | 0.08  | 0.02 | 0.09 | 0.03 | 0.04  | 0.06  |

**ZAG: H6-1**

|            |        |       |      |      |      |       |        |        |       |       |       |        |        |
|------------|--------|-------|------|------|------|-------|--------|--------|-------|-------|-------|--------|--------|
| ZagPhos-1  | p1     | 47.11 | 3.49 | 0.33 | 2.67 | 46.54 | 100.17 | 17.997 | 1.856 | 0.098 | 1.845 | 14.046 | 35.851 |
| ZagPhos-2  | p1     | 47.35 | 3.53 | 0.32 | 2.63 | 46.35 | 100.21 | 18.103 | 1.880 | 0.095 | 1.817 | 14.001 | 35.904 |
| ZagPhos-3  | p1     | 47.39 | 3.50 | 0.34 | 2.63 | 46.44 | 100.33 | 18.094 | 1.861 | 0.101 | 1.819 | 14.011 | 35.892 |
| ZagPhos-4  | p1     | 47.18 | 3.52 | 0.31 | 2.66 | 46.16 | 99.90  | 18.099 | 1.880 | 0.094 | 1.848 | 13.994 | 35.930 |
| ZagPhos-5  | p1     | 47.44 | 3.58 | 0.35 | 2.66 | 46.40 | 100.44 | 18.099 | 1.900 | 0.105 | 1.835 | 13.989 | 35.934 |
| ZagPhos-6  | p1     | 47.27 | 3.50 | 0.42 | 2.65 | 46.06 | 99.90  | 18.148 | 1.868 | 0.127 | 1.841 | 13.975 | 35.959 |
| ZagPhos-11 | p2     | 46.96 | 3.46 | 0.38 | 2.59 | 46.13 | 99.57  | 18.066 | 1.852 | 0.115 | 1.802 | 14.022 | 35.865 |
| ZagPhos-12 | p2     | 47.15 | 3.49 | 0.33 | 2.62 | 45.76 | 99.45  | 18.200 | 1.876 | 0.098 | 1.830 | 13.958 | 35.973 |
| ZagPhos-13 | p2     | 47.38 | 3.55 | 0.36 | 2.69 | 46.41 | 100.45 | 18.081 | 1.886 | 0.106 | 1.859 | 13.994 | 35.934 |
| ZagPhos-14 | p2     | 47.16 | 3.56 | 0.45 | 2.64 | 45.96 | 99.84  | 18.127 | 1.905 | 0.136 | 1.838 | 13.961 | 35.976 |
| ZagPhos-15 | p2     | 46.96 | 3.52 | 0.75 | 2.73 | 45.94 | 99.99  | 18.046 | 1.883 | 0.224 | 1.901 | 13.951 | 36.019 |
| ZagPhos-16 | p2     | 46.70 | 3.56 | 0.59 | 2.70 | 46.38 | 100.02 | 17.884 | 1.896 | 0.175 | 1.869 | 14.035 | 35.875 |
| ZagPhos-17 | p2     | 46.97 | 3.54 | 0.65 | 2.68 | 45.98 | 99.92  | 18.052 | 1.890 | 0.193 | 1.866 | 13.964 | 35.981 |
| ZagPhos-18 | p3     | 46.89 | 3.47 | 0.84 | 2.67 | 45.97 | 99.91  | 18.028 | 1.858 | 0.252 | 1.859 | 13.968 | 35.974 |
| ZagPhos-19 | p3     | 46.97 | 3.49 | 0.55 | 2.65 | 45.85 | 99.57  | 18.109 | 1.870 | 0.164 | 1.847 | 13.968 | 35.967 |
| ZagPhos-20 | p3     | 46.96 | 3.49 | 0.38 | 2.64 | 45.79 | 99.36  | 18.134 | 1.876 | 0.115 | 1.841 | 13.973 | 35.955 |
| ZagPhos-21 | p3     | 47.14 | 3.57 | 0.37 | 2.65 | 46.24 | 100.06 | 18.057 | 1.904 | 0.111 | 1.838 | 13.996 | 35.920 |
| ZagPhos-22 | p3     | 47.42 | 3.52 | 0.40 | 2.68 | 46.50 | 100.58 | 18.073 | 1.866 | 0.119 | 1.851 | 14.001 | 35.920 |
| ZagPhos-23 | p4     | 46.99 | 3.50 | 0.44 | 2.62 | 46.06 | 99.65  | 18.074 | 1.875 | 0.132 | 1.824 | 13.999 | 35.911 |
| ZagPhos-25 | p6     | 47.57 | 3.49 | 0.40 | 2.67 | 46.46 | 100.66 | 18.124 | 1.848 | 0.119 | 1.838 | 13.989 | 35.932 |
| ZagPhos-26 | p6     | 47.17 | 3.51 | 0.62 | 2.65 | 46.22 | 100.26 | 18.057 | 1.870 | 0.185 | 1.833 | 13.980 | 35.941 |
| ZagPhos-27 | p6     | 47.48 | 3.47 | 0.36 | 2.62 | 46.22 | 100.25 | 18.172 | 1.845 | 0.109 | 1.816 | 13.978 | 35.935 |
| ZagPhos-28 | p6     | 47.26 | 3.46 | 0.68 | 2.68 | 46.29 | 100.44 | 18.063 | 1.841 | 0.202 | 1.854 | 13.980 | 35.952 |
| ZagPhos-31 | p10    | 46.67 | 3.46 | 0.74 | 2.55 | 46.00 | 99.44  | 17.993 | 1.856 | 0.221 | 1.781 | 14.013 | 35.869 |
| ZagPhos-32 | p10    | 46.94 | 3.56 | 0.45 | 2.61 | 45.87 | 99.50  | 18.092 | 1.911 | 0.136 | 1.823 | 13.972 | 35.948 |
| ZagPhos-9  | p15    | 47.16 | 3.52 | 0.55 | 2.64 | 46.20 | 100.08 | 18.070 | 1.875 | 0.164 | 1.831 | 13.989 | 35.934 |
| ZagPhos-10 | p15    | 47.02 | 3.54 | 0.48 | 2.62 | 46.27 | 99.96  | 18.022 | 1.886 | 0.141 | 1.817 | 14.013 | 35.889 |
| Zag Ap-43  | P18-20 | 46.22 | 3.54 | 0.48 | 2.72 | 45.34 | 98.36  | 18.023 | 1.923 | 0.146 | 1.917 | 13.970 | 35.997 |
| Zag Ap-45  | P18-20 | 46.11 | 3.55 | 0.86 | 2.75 | 45.06 | 98.38  | 18.026 | 1.932 | 0.261 | 1.943 | 13.919 | 36.116 |
| Zag Ap-46  | P18-20 | 46.27 | 3.51 | 0.38 | 2.73 | 45.49 | 98.41  | 18.017 | 1.903 | 0.115 | 1.927 | 13.996 | 35.967 |
| Zag Ap-47  | P18-20 | 46.76 | 3.55 | 0.52 | 2.81 | 45.99 | 99.65  | 17.994 | 1.902 | 0.157 | 1.959 | 13.985 | 35.999 |
| Zag Ap-55  | P23    | 46.07 | 3.47 | 1.09 | 2.72 | 45.59 | 98.97  | 17.878 | 1.871 | 0.331 | 1.911 | 13.979 | 35.976 |
| Zag Ap-60  | P27    | 46.46 | 3.53 | 0.37 | 2.79 | 45.88 | 99.08  | 17.963 | 1.899 | 0.111 | 1.953 | 14.016 | 35.950 |
| Zag Ap-61  | P27    | 46.64 | 3.50 | 0.48 | 2.79 | 45.58 | 99.08  | 18.070 | 1.887 | 0.144 | 1.953 | 13.954 | 36.030 |
| Zag Ap-66  | P28+   | 45.94 | 3.52 | 0.64 | 2.71 | 45.54 | 98.45  | 17.887 | 1.908 | 0.195 | 1.911 | 14.011 | 35.934 |
| Zag Ap-67  | P28+   | 46.37 | 3.56 | 0.55 | 2.80 | 45.70 | 99.08  | 17.953 | 1.915 | 0.167 | 1.958 | 13.983 | 35.994 |
| Zag Ap-68  | P28+   | 46.29 | 3.49 | 0.43 | 2.75 | 45.83 | 98.83  | 17.934 | 1.883 | 0.129 | 1.927 | 14.033 | 35.919 |
| Zag Ap-69  | P28+   | 46.09 | 3.43 | 0.36 | 2.79 | 45.62 | 98.33  | 17.946 | 1.861 | 0.110 | 1.967 | 14.036 | 35.926 |
| Zag Ap-70  | P28+   | 46.67 | 3.52 | 0.58 | 2.72 | 45.62 | 99.22  | 18.061 | 1.895 | 0.176 | 1.904 | 13.950 | 36.012 |
| Zag Ap-72  | P28+   | 46.13 | 3.49 | 0.52 | 2.75 | 45.19 | 98.12  | 18.039 | 1.896 | 0.159 | 1.944 | 13.965 | 36.017 |
| Zag Ap-73  | P28+   | 46.07 | 3.57 | 0.40 | 2.77 | 45.68 | 98.53  | 17.902 | 1.931 | 0.123 | 1.945 | 14.026 | 35.938 |

|         |  |       |      |      |      |       |       |       |      |      |      |       |       |
|---------|--|-------|------|------|------|-------|-------|-------|------|------|------|-------|-------|
| Average |  | 46.83 | 3.51 | 0.50 | 2.69 | 45.95 | 99.55 | 18.04 | 1.88 | 0.15 | 1.87 | 13.99 | 35.95 |
| 1-sigma |  | 0.48  | 0.04 | 0.18 | 0.06 | 0.37  | 0.72  | 0.08  | 0.02 | 0.05 | 0.05 | 0.03  | 0.05  |

**ZAG: H6-2**

|           |     |       |      |      |      |       |       |        |       |       |       |        |        |
|-----------|-----|-------|------|------|------|-------|-------|--------|-------|-------|-------|--------|--------|
| Zag Ap-22 | M2D | 46.33 | 3.52 | 0.27 | 2.75 | 45.30 | 98.24 | 18.079 | 1.913 | 0.082 | 1.944 | 13.971 | 36.008 |
|-----------|-----|-------|------|------|------|-------|-------|--------|-------|-------|-------|--------|--------|

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Table EA-2: EPMA analyses of apatite

| Analysis   | Grain | CaO   | MgO  | FeO  | Na2O | P2O5  | Y2O3 | Ce2O3 | F    | Cl   | F = -O | Cl = -O | -O = F+Cl | Total  | Cl/F | Structural formulae based on 13 Anions |       |       |       |       |       |       |       |       |       | X site<br>anion<br>total | Missing<br>anion<br>(other) | Σ Tet | Σ Oct | Cl/F | Cl/(Cl+F) |                 |
|--|-------|-------|------|------|------|-------|------|-------|------|------|--------|---------|-----------|--------|------|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|--------------------------|-----------------------------|-------|-------|------|-----------|-----------------|
|  |       |       |      |      |      |       |      |       |      |      |        |         |           |        |      | Ca                                     | Mg    | Fe    | Na    | P     | Cl    | Y     | Ce    | F     | Cl    |                          |                             |       |       |      |           | Cation<br>total |
| Detection limits for Y2O3 and Ce2O3 are 0.05 wt% |       |       |      |      |      |       |      |       |      |      |        |         |           |        |      |  |       |       |       |       |       |       |       |       |       |                          |                             |       |       |      |           |                 |
| AVANHANDAVA                                      |       |       |      |      |      |       |      |       |      |      |        |         |           |        |      |  |       |       |       |       |       |       |       |       |       |                          |                             |       |       |      |           |                 |
| Avan-1   |       | 53.56 | 0.03 | 0.22 | 0.36 | 40.76 | 0.00 | 0.04  | 0.58 | 5.44 | 0.244  | 1.227   | 1.471     | 99.50  | 9.4  | 4.973                                  | 0.003 | 0.016 | 0.060 | 2.990 | 0.000 | 0.001 | 0.159 | 0.799 | 8.044 | 0.958                    | 0.042                       | 2.990 | 5.054 | 5.0  | 0.83      |                 |
| Avan-3   |       | 53.54 | 0.02 | 0.33 | 0.34 | 40.70 | 0.00 | 0.06  | 0.69 | 5.31 | 0.292  | 1.199   | 1.491     | 99.49  | 7.7  | 4.974                                  | 0.002 | 0.024 | 0.057 | 2.988 | 0.000 | 0.002 | 0.190 | 0.781 | 8.046 | 0.971                    | 0.029                       | 2.988 | 5.059 | 4.1  | 0.80      |                 |
| Avan-4   |       | 53.32 | 0.02 | 0.32 | 0.35 | 40.55 | 0.00 | 0.00  | 0.61 | 5.57 | 0.259  | 1.257   | 1.516     | 99.22  | 9.1  | 4.973                                  | 0.003 | 0.023 | 0.059 | 2.989 | 0.000 | 0.000 | 0.169 | 0.822 | 8.046 | 0.991                    | 0.009                       | 2.989 | 5.058 | 4.9  | 0.83      |                 |
| Avan-5   |       | 53.16 | 0.05 | 0.30 | 0.37 | 40.43 | 0.00 | 0.04  | 0.71 | 5.40 | 0.299  | 1.218   | 1.517     | 98.93  | 7.6  | 4.971                                  | 0.006 | 0.022 | 0.062 | 2.987 | 0.000 | 0.001 | 0.196 | 0.799 | 8.050 | 0.995                    | 0.005                       | 2.987 | 5.062 | 4.1  | 0.80      |                 |
| Avanap2-3  |       | 53.81 | 0.04 | 0.59 | 0.33 | 40.95 | 0.04 | 0.05  | 0.55 | 5.48 | 0.230  | 1.236   | 1.466     | 100.37 | 10.0 | 4.961                                  | 0.005 | 0.042 | 0.056 | 2.983 | 0.002 | 0.002 | 0.149 | 0.799 | 8.051 | 0.948                    | 0.052                       | 2.983 | 5.068 | 5.4  | 0.84      |                 |
| Avanap3-1  |       | 53.44 | 0.04 | 0.51 | 0.36 | 40.45 | 0.00 | 0.05  | 0.51 | 5.54 | 0.213  | 1.250   | 1.462     | 99.43  | 11.0 | 4.979                                  | 0.005 | 0.037 | 0.060 | 2.979 | 0.000 | 0.002 | 0.139 | 0.816 | 8.061 | 0.955                    | 0.045                       | 2.979 | 5.083 | 5.9  | 0.85      |                 |
| Avanap3-2  |       | 53.43 | 0.12 | 0.68 | 0.34 | 40.61 | 0.01 | 0.05  | 0.52 | 5.56 | 0.219  | 1.255   | 1.475     | 99.85  | 10.7 | 4.959                                  | 0.015 | 0.049 | 0.057 | 2.978 | 0.001 | 0.002 | 0.143 | 0.817 | 8.060 | 0.959                    | 0.041                       | 2.978 | 5.083 | 5.7  | 0.85      |                 |
| Avanap3-3  |       | 53.47 | 0.07 | 0.57 | 0.36 | 40.94 | 0.00 | 0.08  | 0.57 | 5.35 | 0.238  | 1.207   | 1.445     | 99.96  | 9.5  | 4.941                                  | 0.010 | 0.041 | 0.060 | 2.990 | 0.000 | 0.002 | 0.154 | 0.782 | 8.044 | 0.936                    | 0.064                       | 2.990 | 5.054 | 5.1  | 0.84      |                 |
| Avanap3-4  |       | 53.76 | 0.04 | 0.48 | 0.35 | 40.63 | 0.00 | 0.06  | 0.63 | 5.34 | 0.267  | 1.204   | 1.471     | 99.82  | 8.4  | 4.985                                  | 0.006 | 0.035 | 0.059 | 2.977 | 0.000 | 0.002 | 0.173 | 0.783 | 8.063 | 0.956                    | 0.044                       | 2.977 | 5.086 | 4.5  | 0.82      |                 |
| Average  |       | 53.50 | 0.05 | 0.44 | 0.35 | 40.67 | 0.01 | 0.05  | 0.60 | 5.44 | 0.25   | 1.23    | 1.48      | 99.62  | 9.3  | 4.97                                   | 0.01  | 0.03  | 0.06  | 2.98  | 0.00  | 0.00  | 0.16  | 0.80  | 8.05  | 0.96                     | 0.04                        | 2.98  | 5.07  | 5.0  | 0.83      |                 |
| 1-sigma  |       | 0.20  | 0.03 | 0.16 | 0.01 | 0.19  | 0.01 | 0.02  | 0.07 | 0.10 | 0.03   | 0.02    | 0.02      | 0.43   | 1.2  | 0.01                                   | 0.00  | 0.01  | 0.00  | 0.01  | 0.00  | 0.00  | 0.02  | 0.02  | 0.01  | 0.02                     | 0.02                        | 0.01  | 0.01  | 0.6  | 0.02      |                 |
| RICHARDTON                                       |       |       |      |      |      |       |      |       |      |      |        |         |           |        |      |  |       |       |       |       |       |       |       |       |       |                          |                             |       |       |      |           |                 |
| RichAp1-1  |       | 53.18 | 0.01 | 0.18 | 0.41 | 40.29 | 0.00 | 0.02  | 0.20 | 6.36 | 0.082  | 1.435   | 1.517     | 99.13  | 32.6 | 4.987                                  | 0.001 | 0.013 | 0.069 | 2.985 | 0.000 | 0.001 | 0.054 | 0.943 | 8.056 | 0.997                    | 0.003                       | 2.985 | 5.071 | 17.5 | 0.95      |                 |
| RichAp1-2  |       | 53.42 | 0.02 | 0.15 | 0.42 | 40.44 | 0.00 | 0.01  | 0.35 | 6.11 | 0.147  | 1.380   | 1.526     | 99.39  | 17.6 | 4.989                                  | 0.002 | 0.011 | 0.071 | 2.985 | 0.000 | 0.000 | 0.096 | 0.903 | 8.058 | 0.999                    | 0.001                       | 2.985 | 5.074 | 9.4  | 0.90      |                 |
| RichAp1-3  |       | 53.33 | 0.00 | 0.11 | 0.42 | 40.25 | 0.00 | 0.04  | 0.31 | 6.07 | 0.132  | 1.370   | 1.502     | 99.02  | 19.3 | 5.000                                  | 0.000 | 0.008 | 0.071 | 2.982 | 0.000 | 0.001 | 0.087 | 0.900 | 8.062 | 0.987                    | 0.013                       | 2.982 | 5.080 | 10.4 | 0.91      |                 |
| RichAp1-4  |       | 53.30 | 0.03 | 0.19 | 0.42 | 40.52 | 0.00 | 0.00  | 0.33 | 6.17 | 0.141  | 1.393   | 1.533     | 99.42  | 18.5 | 4.976                                  | 0.003 | 0.014 | 0.071 | 2.989 | 0.000 | 0.000 | 0.092 | 0.908 | 8.052 | 1.004                    | 0.000                       | 2.989 | 5.064 | 9.9  | 0.91      |                 |
| RichAp2-2  |       | 53.04 | 0.04 | 0.23 | 0.36 | 39.95 | 0.00 | 0.00  | 0.24 | 6.52 | 0.100  | 1.472   | 1.572     | 98.81  | 27.5 | 5.003                                  | 0.006 | 0.017 | 0.062 | 2.977 | 0.000 | 0.000 | 0.066 | 0.934 | 8.065 | 1.039                    | 0.000                       | 2.977 | 5.087 | 14.2 | 0.93      |                 |
| RichAp3-3  |       | 53.02 | 0.02 | 0.26 | 0.43 | 40.69 | 0.00 | 0.03  | 0.42 | 6.28 | 0.176  | 1.418   | 1.595     | 99.55  | 15.0 | 4.945                                  | 0.003 | 0.019 | 0.072 | 2.998 | 0.000 | 0.001 | 0.115 | 0.885 | 8.038 | 1.043                    | 0.000                       | 2.998 | 5.039 | 7.7  | 0.88      |                 |
| RichAp3-4  |       | 53.01 | 0.03 | 0.15 | 0.44 | 40.38 | 0.00 | 0.01  | 0.40 | 6.29 | 0.167  | 1.419   | 1.586     | 99.11  | 15.9 | 4.969                                  | 0.004 | 0.011 | 0.074 | 2.991 | 0.000 | 0.000 | 0.110 | 0.890 | 8.050 | 1.042                    | 0.000                       | 2.991 | 5.059 | 8.1  | 0.89      |                 |
| RichAp3-6  |       | 53.66 | 0.01 | 0.26 | 0.39 | 40.42 | 0.00 | 0.03  | 0.24 | 6.09 | 0.103  | 1.375   | 1.477     | 99.62  | 25.0 | 5.003                                  | 0.002 | 0.019 | 0.065 | 2.977 | 0.000 | 0.001 | 0.067 | 0.898 | 8.066 | 0.965                    | 0.035                       | 2.977 | 5.089 | 13.4 | 0.93      |                 |
| RichAp3-7  |       | 53.20 | 0.02 | 0.41 | 0.39 | 40.17 | 0.01 | 0.04  | 0.35 | 6.16 | 0.147  | 1.391   | 1.538     | 99.21  | 17.7 | 4.990                                  | 0.003 | 0.030 | 0.066 | 2.977 | 0.001 | 0.001 | 0.097 | 0.903 | 8.067 | 1.011                    | 0.000                       | 2.977 | 5.090 | 9.4  | 0.90      |                 |
| RichAp2-7  |       | 52.82 | 0.09 | 0.44 | 0.41 | 40.29 | 0.00 | 0.00  | 0.52 | 6.16 | 0.221  | 1.391   | 1.611     | 99.13  | 11.8 | 4.955                                  | 0.012 | 0.032 | 0.069 | 2.987 | 0.000 | 0.000 | 0.145 | 0.855 | 8.055 | 1.059                    | 0.000                       | 2.987 | 5.068 | 5.9  | 0.85      |                 |
| RichAp2-9  |       | 52.57 | 0.27 | 0.42 | 0.42 | 40.14 | 0.01 | 0.05  | 0.42 | 6.03 | 0.178  | 1.361   | 1.539     | 98.79  | 14.3 | 4.941                                  | 0.035 | 0.031 | 0.071 | 2.982 | 0.000 | 0.002 | 0.117 | 0.883 | 8.062 | 1.014                    | 0.000                       | 2.982 | 5.080 | 7.5  | 0.88      |                 |
| RichAp2-10                                       |       | 52.84 | 0.06 | 0.31 | 0.46 | 40.52 | 0.00 | 0.07  | 0.45 | 6.25 | 0.189  | 1.410   | 1.600     | 99.37  | 13.9 | 4.941                                  | 0.008 | 0.023 | 0.078 | 2.994 | 0.000 | 0.002 | 0.124 | 0.876 | 8.046 | 1.049                    | 0.000                       | 2.994 | 5.052 | 7.1  | 0.88      |                 |
| RichAp4-2  |       | 53.50 | 0.04 | 0.27 | 0.46 | 40.35 | 0.00 | 0.05  | 0.19 | 5.92 | 0.082  | 1.335   | 1.417     | 99.37  | 30.5 | 4.993                                  | 0.005 | 0.020 | 0.078 | 2.976 | 0.000 | 0.002 | 0.053 | 0.873 | 8.074 | 0.927                    | 0.073                       | 2.976 | 5.098 | 16.3 | 0.94      |                 |
| RichAp4-5  |       | 53.36 | 0.05 | 0.20 | 0.41 | 40.19 | 0.00 | 0.04  | 0.09 | 6.32 | 0.037  | 1.426   | 1.463     | 99.20  | 71.8 | 5.000                                  | 0.007 | 0.015 | 0.070 | 2.976 | 0.000 | 0.001 | 0.024 | 0.937 | 8.070 | 0.961                    | 0.039                       | 2.976 | 5.094 | 38.5 | 0.97      |                 |
| RichAp5-1  |       | 53.06 | 0.05 | 0.45 | 0.42 | 40.57 | 0.00 | 0.00  | 0.32 | 6.35 | 0.133  | 1.433   | 1.566     | 99.66  | 20.1 | 4.949                                  | 0.007 | 0.033 | 0.070 | 2.990 | 0.000 | 0.000 | 0.087 | 0.913 | 8.050 | 1.024                    | 0.000                       | 2.990 | 5.059 | 10.5 | 0.91      |                 |
| RichAp6-3  |       | 52.79 | 0.09 | 0.30 | 0.42 | 40.14 | 0.00 | 0.01  | 0.27 | 6.31 | 0.112  | 1.424   | 1.536     | 98.77  | 23.7 | 4.968                                  | 0.011 | 0.022 | 0.071 | 2.985 | 0.000 | 0.000 | 0.074 | 0.926 | 8.058 | 1.013                    | 0.000                       | 2.985 | 5.073 | 12.5 | 0.93      |                 |
| Average  |       | 53.13 | 0.05 | 0.27 | 0.42 | 40.33 | 0.00 | 0.02  | 0.32 | 6.21 | 0.13   | 1.40    | 1.54      | 99.22  | 23.4 | 4.98                                   | 0.01  | 0.02  | 0.07  | 2.98  | 0.00  | 0.00  | 0.09  | 0.90  | 8.06  | 1.01                     | 0.01                        | 2.98  | 5.07  | 12.4 | 0.91      |                 |
| 1-sigma  |       | 0.29  | 0.06 | 0.11 | 0.02 | 0.19  | 0.00 | 0.02  | 0.11 | 0.15 | 0.05   | 0.03    | 0.05      | 0.28   | 14.3 | 0.02                                   | 0.01  | 0.01  | 0.00  | 0.01  | 0.00  | 0.00  | 0.03  | 0.02  | 0.01  | 0.04                     | 0.02                        | 0.01  | 0.02  | 7.7  | 0.03      |                 |
| ORO GRANDE: HOST                                 |       |       |      |      |      |       |      |       |      |      |        |         |           |        |      |  |       |       |       |       |       |       |       |       |       |                          |                             |       |       |      |           |                 |
| OroAp1-1   |       | 53.67 | 0.06 | 0.40 | 0.31 | 41.13 | 0.00 | 0.04  | 0.92 | 4.76 | 0.388  | 1.075   | 1.463     | 99.82  | 5.2  | 4.947                                  | 0.008 | 0.029 | 0.051 | 2.996 | 0.000 | 0.001 | 0.251 | 0.694 | 8.031 | 0.945                    | 0.055                       | 2.996 | 5.036 | 2.8  | 0.73      |                 |
| OroAp1-2   |       | 54.31 | 0.05 | 0.29 | 0.29 | 40.35 | 0.00 | 0.03  | 0.95 | 4.54 | 0.401  | 1.023   | 1.425     | 99.39  | 4.8  | 5.044                                  | 0.007 | 0.021 | 0.049 | 2.961 | 0.000 | 0.001 | 0.261 | 0.666 | 8.083 | 0.928                    | 0.072                       | 2.961 | 5.122 | 2.6  | 0.72      |                 |
| OroAp1-5   |       | 53.59 | 0.07 | 0.51 | 0.26 | 39.75 | 0.00 | 0.03  | 0.83 | 5.09 | 0.349  | 1.149   | 1.498     | 98.62  | 6.1  | 5.042                                  | 0.009 | 0.037 | 0.044 | 2.955 | 0.000 | 0.001 | 0.230 | 0.758 | 8.088 | 0.988                    | 0.012                       | 2.955 | 5.133 | 3.3  | 0.77      |                 |
| OroAp2-5   |       | 53.79 | 0.11 | 0.46 | 0.30 | 40.13 | 0.00 | 0.00  | 0.75 | 5.00 | 0.317  | 1.128   | 1.445     | 99.09  | 6.6  | 5.024                                  | 0.014 | 0.034 | 0.050 | 2.962 | 0.000 | 0.000 | 0.207 | 0.739 | 8.083 | 0.946                    | 0.054                       | 2.962 | 5.121 | 3.6  | 0.78      |                 |
| OroAp4-1   |       | 54.00 | 0.06 | 0.22 | 0.30 | 40.60 | 0.02 | 0.00  | 0.72 | 5.06 | 0.301  | 1.142   | 1.443     | 99.53  | 7.1  | 5.010                                  | 0.007 | 0.016 | 0.050 | 2.976 | 0.001 | 0.000 | 0.196 | 0.742 | 8.060 | 0.938                    | 0.062                       | 2.976 | 5.084 | 3.8  | 0.79      |                 |
| OroAp4-3   |       | 53.85 | 0.14 | 0.35 | 0.33 | 40.08 | 0.00 | 0.08  | 0.62 | 5.17 | 0.261  | 1.167   | 1.428     | 99.20  | 8.4  | 5.029                                  | 0.018 | 0.026 | 0.056 | 2.958 | 0.000 | 0.003 | 0.171 | 0.764 | 8.089 | 0.935                    | 0.065                       | 2.958 | 5.131 | 4.5  | 0.82      |                 |
| OroAp4-4   |       | 53.53 | 0.10 | 0.38 | 0.36 | 40.47 | 0.00 | 0.08  | 0.73 | 5.14 | 0.307  | 1.159   | 1.466     | 99.31  | 7.0  | 4.983                                  | 0.013 | 0.028 | 0.060 | 2.977 | 0.000 | 0.003 | 0.200 | 0.757 | 8.063 | 0.957                    | 0.043                       | 2.977 | 5.0   |      |           |                 |

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JONES ET AL.: PHOSPHATE MINERALS IN H CHONDRITES

|                |        |       |      |      |       |       |      |      |      |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |      |  |
|----------------|--------|-------|------|------|-------|-------|------|------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|--|
| estacado-59    | 53.70  | 0.03  | 0.04 | 0.38 | 41.05 | 0.00  | 0.02 | 0.34 | 5.89 | 0.141 | 1.329 | 1.470 | 99.97 | 17.6  | 4.964 | 0.003 | 0.003 | 0.063 | 2.999 | 0.000 | 0.001 | 0.091 | 0.861 | 8.033 | 0.952 | 0.048 | 2.999 | 5.034 | 9.4   | 0.90  |      |  |
| estacado-60    | 53.76  | 0.03  | 0.08 | 0.41 | 40.83 | 0.00  | 0.00 | 0.52 | 5.54 | 0.219 | 1.249 | 1.469 | 99.70 | 10.6  | 4.982 | 0.003 | 0.006 | 0.069 | 2.990 | 0.000 | 0.000 | 0.142 | 0.812 | 8.050 | 0.954 | 0.046 | 2.990 | 5.060 | 5.7   | 0.85  |      |  |
| Average        | 53.58  | 0.05  | 0.18 | 0.43 | 40.75 | 0.01  | 0.03 | 0.38 | 5.53 | 0.16  | 1.25  | 1.41  | 99.54 | 16.0  | 4.97  | 0.01  | 0.01  | 0.07  | 2.99  | 0.00  | 0.00  | 0.11  | 0.81  | 8.05  | 0.92  | 0.08  | 2.99  | 5.07  | 8.6   | 0.89  |      |  |
| 1-sigma        | 0.20   | 0.03  | 0.12 | 0.03 | 0.25  | 0.01  | 0.03 | 0.12 | 0.22 | 0.05  | 0.05  | 0.05  | 0.36  | 5.9   | 0.01  | 0.00  | 0.01  | 0.01  | 0.01  | 0.00  | 0.00  | 0.03  | 0.03  | 0.01  | 0.04  | 0.04  | 0.01  | 0.02  | 3.2   | 0.03  |      |  |
| ZAG: H4 Matrix |        |       |      |      |       |       |      |      |      |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |      |  |
| Zag Ap-28      | M2A3   | 52.32 | 0.11 | 0.46 | 0.60  | 40.32 | 0.00 | 0.05 | 0.17 | 5.90  | 0.072 | 1.330 | 1.402 | 98.53 | 34.7  | 4.915 | 0.015 | 0.034 | 0.102 | 2.993 | 0.000 | 0.002 | 0.047 | 0.876 | 8.061 | 0.923 | 0.077 | 2.993 | 5.068 | 18.6  | 0.95 |  |
| Zag Ap-29      | M2A3   | 52.18 | 0.17 | 0.63 | 0.60  | 40.55 | 0.00 | 0.01 | 0.24 | 5.66  | 0.099 | 1.277 | 1.376 | 98.65 | 24.0  | 4.884 | 0.022 | 0.046 | 0.101 | 2.999 | 0.000 | 0.000 | 0.065 | 0.838 | 8.052 | 0.903 | 0.097 | 2.999 | 5.053 | 12.8  | 0.93 |  |
| Zag Ap-30      | M2A3   | 52.16 | 0.18 | 0.71 | 0.63  | 40.92 | 0.00 | 0.00 | 0.25 | 5.64  | 0.105 | 1.273 | 1.379 | 99.11 | 22.6  | 4.852 | 0.023 | 0.052 | 0.105 | 3.008 | 0.000 | 0.000 | 0.069 | 0.830 | 8.041 | 0.899 | 0.101 | 3.008 | 5.032 | 12.1  | 0.92 |  |
| Zag Ap-5       | P12    | 52.06 | 0.07 | 1.78 | 0.39  | 40.16 | 0.02 | 0.03 | 0.03 | 6.17  | 0.014 | 1.391 | 1.405 | 99.30 | 186.8 | 4.883 | 0.010 | 0.130 | 0.067 | 2.976 | 0.001 | 0.001 | 0.009 | 0.915 | 8.068 | 0.924 | 0.076 | 2.976 | 5.091 | 100.1 | 0.99 |  |
| Zag Ap-6       | P12    | 52.83 | 0.08 | 0.52 | 0.46  | 40.67 | 0.00 | 0.00 | 0.23 | 5.77  | 0.099 | 1.301 | 1.400 | 99.16 | 24.6  | 4.924 | 0.010 | 0.038 | 0.078 | 2.996 | 0.000 | 0.000 | 0.064 | 0.850 | 8.046 | 0.915 | 0.085 | 2.996 | 5.050 | 13.2  | 0.93 |  |
| Zag Ap-7       | P12    | 52.59 | 0.06 | 0.52 | 0.47  | 40.59 | 0.01 | 0.00 | 0.19 | 5.77  | 0.080 | 1.303 | 1.382 | 98.82 | 30.5  | 4.917 | 0.007 | 0.038 | 0.080 | 2.999 | 0.001 | 0.000 | 0.052 | 0.854 | 8.042 | 0.906 | 0.094 | 2.999 | 5.043 | 16.4  | 0.94 |  |
| Zag Ap-8       | P12    | 52.31 | 0.10 | 0.53 | 0.50  | 40.28 | 0.03 | 0.05 | 0.07 | 5.77  | 0.028 | 1.302 | 1.330 | 98.28 | 87.4  | 4.919 | 0.013 | 0.039 | 0.085 | 2.993 | 0.001 | 0.002 | 0.018 | 0.858 | 8.051 | 0.877 | 0.123 | 2.993 | 5.058 | 46.9  | 0.98 |  |
| Zag Ap-9       | P12    | 52.64 | 0.09 | 0.80 | 0.54  | 40.46 | 0.04 | 0.00 | 0.13 | 5.73  | 0.056 | 1.293 | 1.349 | 99.08 | 42.7  | 4.916 | 0.012 | 0.058 | 0.092 | 2.986 | 0.002 | 0.000 | 0.037 | 0.846 | 8.066 | 0.883 | 0.117 | 2.986 | 5.080 | 22.9  | 0.96 |  |
| Zag Ap-3       | P16    | 51.96 | 0.10 | 0.30 | 0.56  | 39.98 | 0.01 | 0.00 | 0.13 | 5.77  | 0.055 | 1.302 | 1.356 | 97.45 | 44.4  | 4.927 | 0.014 | 0.022 | 0.096 | 2.996 | 0.001 | 0.000 | 0.036 | 0.865 | 8.054 | 0.902 | 0.098 | 2.996 | 5.059 | 23.8  | 0.96 |  |
| Zag Ap-4       | P16    | 52.57 | 0.12 | 0.69 | 0.54  | 40.48 | 0.00 | 0.01 | 0.31 | 5.55  | 0.132 | 1.252 | 1.384 | 98.90 | 17.7  | 4.913 | 0.015 | 0.050 | 0.092 | 2.990 | 0.000 | 0.000 | 0.086 | 0.820 | 8.061 | 0.906 | 0.094 | 2.990 | 5.071 | 9.5   | 0.90 |  |
| Zag Ap         | P8     | 52.78 | 0.06 | 0.33 | 0.38  | 40.55 | 0.00 | 0.04 | 0.13 | 6.13  | 0.056 | 1.383 | 1.439 | 98.96 | 46.4  | 4.939 | 0.007 | 0.024 | 0.065 | 2.998 | 0.000 | 0.001 | 0.036 | 0.907 | 8.034 | 0.944 | 0.056 | 2.998 | 5.036 | 24.9  | 0.96 |  |
| Zag Ap-2       | P8     | 52.19 | 0.05 | 0.17 | 0.35  | 40.26 | 0.03 | 0.02 | 0.08 | 6.17  | 0.033 | 1.393 | 1.426 | 97.90 | 79.1  | 4.932 | 0.006 | 0.013 | 0.060 | 3.006 | 0.001 | 0.001 | 0.022 | 0.923 | 8.019 | 0.945 | 0.055 | 3.006 | 5.013 | 42.4  | 0.98 |  |
| Zag Ap-39      | Px     | 51.88 | 0.17 | 0.43 | 0.49  | 40.48 | 0.01 | 0.04 | 0.14 | 5.93  | 0.059 | 1.338 | 1.397 | 98.16 | 42.3  | 4.880 | 0.022 | 0.032 | 0.083 | 3.009 | 0.000 | 0.001 | 0.039 | 0.882 | 8.027 | 0.921 | 0.079 | 3.009 | 5.018 | 22.7  | 0.96 |  |
| Average        | 52.34  | 0.10  | 0.61 | 0.50 | 40.44 | 0.01  | 0.02 | 0.16 | 5.84 | 0.07  | 1.32  | 1.39  | 98.64 | 52.6  | 4.91  | 0.01  | 0.04  | 0.09  | 3.00  | 0.00  | 0.00  | 0.045 | 0.867 | 8.05  | 0.91  | 0.089 | 3.00  | 5.05  | 28.2  | 0.95  |      |  |
| 1-sigma        | 0.31   | 0.04  | 0.39 | 0.09 | 0.24  | 0.01  | 0.02 | 0.08 | 0.20 | 0.03  | 0.05  | 0.03  | 0.55  | 45.4  | 0.03  | 0.01  | 0.03  | 0.01  | 0.01  | 0.00  | 0.00  | 0.02  | 0.03  | 0.01  | 0.02  | 0.02  | 0.01  | 0.02  | 24.3  | 0.02  |      |  |
| ZAG: H6-1      |        |       |      |      |       |       |      |      |      |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |      |  |
| Zag Ap-40      | P18-20 | 53.77 | 0.03 | 0.32 | 0.24  | 41.49 | 0.03 | 0.05 | 1.56 | 3.46  | 0.655 | 0.781 | 1.436 | 99.51 | 2.2   | 4.932 | 0.004 | 0.023 | 0.040 | 3.007 | 0.001 | 0.002 | 0.421 | 0.502 | 8.008 | 0.923 | 0.077 | 3.007 | 5.001 | 1.2   | 0.54 |  |
| Zag Ap-41      | P18-20 | 54.00 | 0.03 | 0.19 | 0.20  | 41.33 | 0.00 | 0.01 | 1.82 | 3.03  | 0.765 | 0.683 | 1.448 | 99.14 | 1.7   | 4.963 | 0.004 | 0.013 | 0.033 | 3.001 | 0.000 | 0.000 | 0.493 | 0.440 | 8.014 | 0.933 | 0.067 | 3.001 | 5.013 | 0.9   | 0.47 |  |
| Zag Ap-42      | P18-20 | 53.71 | 0.04 | 0.26 | 0.23  | 40.71 | 0.02 | 0.01 | 1.86 | 2.98  | 0.784 | 0.672 | 1.456 | 98.36 | 1.6   | 4.988 | 0.005 | 0.019 | 0.039 | 2.987 | 0.001 | 0.000 | 0.510 | 0.438 | 8.038 | 0.948 | 0.052 | 2.987 | 5.051 | 0.9   | 0.46 |  |
| Zag Ap-44      | P18-20 | 53.63 | 0.06 | 0.52 | 0.26  | 40.47 | 0.00 | 0.00 | 1.71 | 3.17  | 0.719 | 0.716 | 1.435 | 98.39 | 1.9   | 4.992 | 0.008 | 0.038 | 0.043 | 2.976 | 0.000 | 0.000 | 0.469 | 0.467 | 8.057 | 0.936 | 0.064 | 2.976 | 5.081 | 1.0   | 0.50 |  |
| Zag Ap-48      | P18-20 | 53.48 | 0.02 | 0.57 | 0.29  | 41.31 | 0.01 | 0.00 | 0.98 | 4.46  | 0.414 | 1.006 | 1.420 | 99.69 | 4.5   | 4.922 | 0.002 | 0.041 | 0.048 | 3.004 | 0.000 | 0.000 | 0.267 | 0.649 | 8.017 | 0.916 | 0.084 | 3.004 | 5.012 | 2.4   | 0.71 |  |
| Zag Ap-49      | P18-20 | 53.59 | 0.06 | 0.30 | 0.24  | 40.52 | 0.03 | 0.00 | 1.42 | 3.56  | 0.598 | 0.804 | 1.402 | 98.32 | 2.5   | 4.992 | 0.008 | 0.022 | 0.041 | 2.982 | 0.001 | 0.000 | 0.390 | 0.525 | 8.046 | 0.915 | 0.085 | 2.982 | 5.064 | 1.3   | 0.57 |  |
| Zag Ap-50      | P18-20 | 53.15 | 0.09 | 0.49 | 0.29  | 40.56 | 0.00 | 0.02 | 1.40 | 3.78  | 0.590 | 0.853 | 1.443 | 98.34 | 2.7   | 4.956 | 0.012 | 0.036 | 0.049 | 2.988 | 0.000 | 0.001 | 0.386 | 0.557 | 8.041 | 0.943 | 0.057 | 2.988 | 5.053 | 1.4   | 0.59 |  |
| Zag Ap-51      | P18-20 | 52.72 | 0.11 | 0.34 | 0.31  | 40.67 | 0.00 | 0.00 | 1.24 | 4.10  | 0.520 | 0.925 | 1.445 | 98.03 | 3.3   | 4.927 | 0.014 | 0.025 | 0.053 | 3.003 | 0.000 | 0.000 | 0.341 | 0.606 | 8.022 | 0.946 | 0.054 | 3.003 | 5.018 | 1.8   | 0.64 |  |
| Zag Ap-52      | P18-20 | 52.77 | 0.08 | 0.46 | 0.33  | 40.49 | 0.00 | 0.02 | 1.21 | 4.08  | 0.508 | 0.921 | 1.428 | 98.01 | 3.4   | 4.939 | 0.011 | 0.034 | 0.056 | 2.995 | 0.000 | 0.001 | 0.333 | 0.604 | 8.035 | 0.937 | 0.063 | 2.995 | 5.040 | 1.8   | 0.64 |  |
| Zag Ap-53      | P22    | 53.38 | 0.11 | 0.23 | 0.27  | 40.72 | 0.00 | 0.03 | 1.12 | 4.14  | 0.472 | 0.935 | 1.406 | 98.59 | 3.7   | 4.964 | 0.014 | 0.017 | 0.045 | 2.992 | 0.000 | 0.001 | 0.307 | 0.609 | 8.033 | 0.917 | 0.083 | 2.992 | 5.041 | 2.0   | 0.66 |  |
| Zag Ap-54      | P22    | 53.75 | 0.03 | 0.15 | 0.27  | 40.54 | 0.00 | 0.01 | 1.25 | 3.99  | 0.528 | 0.900 | 1.428 | 98.55 | 3.2   | 5.005 | 0.003 | 0.011 | 0.045 | 2.983 | 0.000 | 0.000 | 0.344 | 0.587 | 8.047 | 0.932 | 0.068 | 2.983 | 5.064 | 1.7   | 0.63 |  |
| Zag Ap-56      | P24    | 53.51 | 0.06 | 0.99 | 0.20  | 41.14 | 0.00 | 0.02 | 1.91 | 2.93  | 0.804 | 0.662 | 1.466 | 99.29 | 1.5   | 4.925 | 0.007 | 0.071 | 0.034 | 2.992 | 0.000 | 0.001 | 0.519 | 0.427 | 8.029 | 0.946 | 0.054 | 2.992 | 5.037 | 0.8   | 0.45 |  |
| Zag Ap-57      | P25    | 53.03 | 0.04 | 0.48 | 0.32  | 40.44 | 0.00 | 0.00 | 0.97 | 4.30  | 0.410 | 0.970 | 1.380 | 98.20 | 4.4   | 4.960 | 0.005 | 0.035 | 0.054 | 2.989 | 0.000 | 0.000 | 0.269 | 0.636 | 8.043 | 0.905 | 0.095 | 2.989 | 5.054 | 2.4   | 0.70 |  |
| Zag Ap-58      | P25    | 53.63 | 0.05 | 0.41 | 0.23  | 40.71 | 0.00 | 0.01 | 1.84 | 3.01  | 0.776 | 0.680 | 1.456 | 98.43 | 1.6   | 4.979 | 0.006 | 0.030 | 0.038 | 2.986 | 0.000 | 0.000 | 0.505 | 0.443 | 8.040 | 0.947 | 0.053 | 2.986 | 5.053 | 0.9   | 0.47 |  |
| Zag Ap-59      | P26    | 53.74 | 0.02 | 0.33 | 0.19  | 41.07 | 0.00 | 0.00 | 1.89 | 2.93  | 0.794 | 0.661 | 1.456 | 98.72 | 1.6   | 4.963 | 0.003 | 0.024 | 0.032 | 2.998 | 0.000 | 0.000 | 0.514 | 0.428 | 8.020 | 0.942 | 0.058 | 2.998 | 5.022 | 0.8   | 0.45 |  |
| Zag Ap-62      | P28+   | 53.36 | 0.09 | 0    |       |       |      |      |      |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |      |  |