Design of six sigma quick switching variables sampling system of type indexed by six sigma AQL and six sigma AOQL

Dr. D Senthilkumar and Dr. B Esha Raffie

Abstract
This article gives designing procedure of Six Sigma Quick Switching Variables Sampling System (SSQSVSS \((n_{T\sigma}, n_{N\sigma}; k_{\sigma})\)) indexed by Six Sigma AQL and Six Sigma AOQL. The design procedure constructed tables for easy selection of system given indexed by six sigma quality levels by known and unknown \(\sigma\) respectively.

Keywords: quick switching sampling system, six sigma, AOQ, AOQL, six sigma AQL and six sigma AOQL

Introduction
The designing procedure for the SSQSVSS \((n_{T\sigma}, n_{N\sigma}; k_{\sigma})\) indexed by SSAQL and SSAOQL is based on Govindaraju (1990) \cite{3} procedures and tables, developing for the selection of single sampling plan for variables indexed by AQL and AOQL. Soundararajan (1981) \cite{9} has developed procedures and tables for the selection of single sampling plans for attributes for given AQL and AOQL. Govindaraju (1990) \cite{3} has developed procedures and tables for the selection of single sampling plans for variables indexed by AQL and AOQL. Later Soundarajan and Palanivel (2000) \cite{8} have developed procedures and tables for the selection of quick switching single sampling variables systems indexed by AQL and AOQL. Based on above article Senthilkumar and Esha Raffie (2017) \cite{6} have constructed SSQSVSS \((n_{T\sigma}, k_{T\sigma}, k_{N\sigma})\) indexed by Six Sigma AQL and Six Sigma AOQL. The extension work of SSQSVSS \((n_{N\sigma}, n_{T\sigma}, k_{\sigma})\) indexed by Six Sigma AQL and Six Sigma AOQL are given in this article. This concept can be extended to variable quality characteristics of the study, the resulting plan would be designated as SSQSVSS and would be applied under the following conditions:

- The production is steady, so that results on current and preceding lots are broadly indicative of a continuous process.
- Lots are submitted substantially in the order of production.
- Inspection is by variables, with the quality being defined as the fraction of non-conforming.
- The sample units are selected from a large lot and production is continuous.
- The production process should depend on automation and human handling is very negligible.
- The industry may adopt system method with decision makers having an experience in adopting the six sigma quality initiatives.

Basic Assumptions
- The quality characteristic is represented by a random variable \(X\) measurable on a continuous scale.
- Distribution of \(X\) is normal with mean and standard deviation.
- An upper limit \(U\), has been specified and a product is qualified as defective when \(X > U\).
- The lower limit \(L\) is specified, the product is defective if \(X < L\).
- The purpose of inspection is to control the fraction defective, \(p\) in the lot inspected.
The condition for application above basic assumptions of SSQSVSS \((n_{T\sigma}, n_{N\sigma}; k_{\sigma})\) system are the same as that of the SSQSVSS \((n_{\sigma}; k_{T\sigma}, k_{N\sigma})\) system.

The fraction defective in a lot will be
\[
p = 1 - F(v) = F(-v) \quad \text{with} \quad v = (U - \mu)/\sigma \quad \text{and} \quad F(y) = \int_{-\infty}^{y} \frac{1}{\sqrt{2\pi}} e^{-z^2/2} \, dz
\]
(1)

Where \(z \sim N(0, 1)\). Under the \(\sigma\)-method plan, the lot would be accepted if \(\bar{X} + k_{\sigma} \leq U\), where \(U\) is the upper specification limit or \(\bar{X} + k_{\sigma} \geq L\), where \(L\) is the lower specification limit.

**Procedure of SSQSVSS \((n_{T\sigma}, n_{N\sigma}; k_{\sigma})\) with known \(\sigma\) variables plan as the reference plan**

The Six Sigma Quick Switching Variables Sampling System with known \(\sigma\) variables plan as the reference plan has following operating procedure

**Operating procedure**

Step 1: Under normal inspection, draw a sample of size \(n_{N\sigma}\) from the lot, inspect and record the measurement of the quality characteristic for each unit of the sample. Compute the sample mean \(\bar{X}\). Where \(\bar{X} = \sum_{i=1}^{n_{N\sigma}} x_i/n_{N\sigma}\)

Step 2: i) If \(\bar{X} + k_{\sigma} \leq U\) or \(\bar{X} + k_{\sigma} \geq L\) accept the lot and repeat Step 1 for the next lot.

ii) If \(\bar{X} + k_{\sigma} > U\) or \(\bar{X} + k_{\sigma} < L\), reject the lot go to Step 3.

Step 3: Under tightened inspection, draw a sample of size \(n_{T\sigma}\) from the next lot inspect and record the measurement of the quality characteristic for each unit of the sample. Compute the sample mean \(\bar{X}\). Where \(\bar{X} = \sum_{i=1}^{n_{T\sigma}} x_i/n_{T\sigma}\)

Step 4: i) If \(\bar{X} + k_{\sigma} \leq U\) or \(\bar{X} + k_{\sigma} \geq L\) accept the lot and repeat Step 1, for the next lot.

ii) If \(\bar{X} + k_{\sigma} > U\) or \(\bar{X} + k_{\sigma} < L\), reject the lot and repeat Step 3.

Where \(n_{N\sigma}\) and \(n_{T\sigma}\) are the sample sizes of normal and tightened single sampling variable plans respectively, and \(k\) is the acceptance constant under \(\sigma\)-method. Where \(\bar{X}\) and \(\sigma\) are the average quality characteristic and standard deviation respectively.

Based on Romboski (1969), the OC function of SSQSVSS \((n_{T\sigma}, n_{N\sigma}; k_{\sigma})\) can be written as
\[
P_a(p) = \frac{P_T}{1-P_N+P_T}
\]
(2)

The fraction nonconforming in a given lot has been given in (1) with \(v = (U-\mu)/\sigma\) and its probability of acceptance will be
\[
P_a(p) = F(w_N, w_T)
\]
With
\[
w_N = (v - k_{\sigma}) \sqrt{n_{N\sigma}}
\]
\[
w_T = (v - k_{\sigma}) \sqrt{n_{T\sigma}}
\]
(3) (4)

If the quality of the accepted lot is \(p\) and all defective units found in the rejected lots are replaced by non-defective units in a rectifying inspection plan, the Six Sigma average outgoing quality (SSAOQ) can be approximated as
\[
SSAOQ = pP_a(p)
\]
(5)

where \(P_a(p)\) is defined in equation (2). If \(p_{na}\) is the proportion nonconforming items at which SSAOQ is maximum, one has
\[
SSAOQL = p_{na}P_a(p_{na})
\]
(6)

If SSAQL \((p_1)\) is prescribed, then the corresponding value of \(v_{SSAQL}\) or \(v_1\) will be fixed and if \(P_a(p)\) is fixed at 99.99966%, that is, \((1-\alpha)\). Where, \(\alpha = 0.0000034x10^{-6}\). Hence we have
\[
P_a(p_1) = (1-\alpha)
\]

So that for given values of \(n_{n_\sigma}, w_N, w_T\) and SSAQL, \(k_{N\sigma}, k_{T\sigma}\) are determined.
Selection of known $\sigma$ SSQSVSS ($n_{Ts}, b_{Ns}; k_a$) for given SSAQL and SSAOQL

Table 1 is used for selection of $\sigma$-method SSQS Variables Sampling System. For example, if the SSAQL is fixed at 0.000005 and the SSAOQL is fixed at 0.000006, Table 1 yields $n_{Ts} = 7731$, $b_{Ns} = 3865$ and $k_a = 3.941$, which is associated with 4.6 sigma level of SSQSVSS ($n_{Ts}, b_{Ns}; k_a$). The sample size $n_{Ts} = m b_{Ns} = (2) (3865) = 7731$. Thus, for the requirement, the SSQSVSS ($n_{Ts}, b_{Ns}; k_a$) is specified by the parameters $n_{Ts} = 7731$, $b_{Ns} = 3865$ and $k_a = 3.941$.

The user of Table 1 should understand the limitations of plans indexed by SSAOQL. Sampling with rectifying of rejected lots on the one hand reduces the average percentage of nonconforming items in the lots, but on the other hand introduces non-homogeneity in the series of lots finally accepted. That is, any particular lot will have a quality of $p\%$ or $0\%$ nonconforming.

Construction of Table 1

For constructing Table 1, a trial value of $p_m$ is assumed and the probability of acceptance at $p_m$ is found using (6) as

$$P_a(p_m) = \text{SSAQO} / p_m$$

(7)

The auxiliary variables $v_m$, $w_m$, and $w_{Tm}$ corresponding to the values of $p_m$ and $P_a(p_m)$ respectively, are found using (1), (2), (3) and (4). For given values of ($p_m$, $\alpha$), determine the values of $v_1$, $w_{N1}$ and $w_{T1}$ using the approximation (Abramwitz and Stegun (1972)) for the ordinate of the cumulative normal distribution. With the values of $v_m$, $w_{Nm}$ and $w_{Tm}$, the following equation is used for calculating $n_{Nm}$.

$$n_{Nm} = (-\text{AOQL}) / \left( (p_m)^2 \left( \sqrt{(\exp(v_m^2 - w_{Nm}^2)} - P_T \left( \sqrt{(\exp(v_m^2 - w_{N1}^2)} - \sqrt{(\exp(v_m^2 - w_{T1}^2)}) \right) / (1 - P_N + P_T)^2 \right) \right)$$

(8)

“124”

Procedure of unknown $\sigma$ SSQSVSS for given SSAQL and SSLQL

If the population standard deviation $\sigma$ is unknown, then it is estimated from the sample standard deviation $S$ (n-1 as the divisor). If the sample size of the unknown sigma variables system (S-method) is $n_{Ts}$, $b_{Ns}$ and the acceptance constant is $k_a$, then the operating procedure is as follows

Step 1: Draw a sample of size $n$, from the lot, inspect and record the measurement of the quality characteristic for each unit of the sample. Compute the sample mean $\bar{x}$ and sample standard deviation $S_N$.

Where

$$\bar{x} = \frac{\sum x_i}{n_N}, \text{ and } S_N = \sqrt{\frac{\sum (x_i - \bar{x})^2}{n_N - 1}}$$

Step 2: i) If $\bar{x} + k_s S_N \leq U$ or $\bar{x} + k_s S_N \geq L$ accept the lot and repeat Step 1 for the next lot.

ii) If $\bar{x} + k_s S_i > U$ or $\bar{x} + k_s S_i < L$ reject the lot go to Step 3.

Step 3: Draw a sample of size $n$, from the next lot inspect and record the measurement of the quality characteristic for each unit of the sample. Compute the sample mean $\bar{x}$ and sample standard deviation $S_T$.

Where

$$\bar{x} = \frac{\sum x_i}{n_T}, \text{ and } S_T = \sqrt{\frac{\sum (x_i - \bar{x})^2}{n_T - 1}}$$

Step 4: i) If $\bar{x} + k_s S_j \leq U$ or $\bar{x} + k_s S_j \geq L$ accept the lot and repeat Step 1 for the next lot.

ii) If $\bar{x} + k_s S_j > U$ or $\bar{x} + k_s S_j < L$ reject the lot and repeat Step 3.

Selection of unknown $\sigma$ SSQSVSS ($n_{Ts}, b_{Ns}; k_a$) for Given SSAQL and SSAOQL

Table 1 also gives such matched s-method plan. For example, for given SSAQL is 0.000001 and SSAOQL is 0.000004, one obtains the parameters of the s-method plan from Table 1 to be $n_{Ts} = 5030$, $b_{Ns} = 2515$ and $k_a = 3.620$, which is associated with 4.5 sigma level of SSQSVSS ($n_{Ts}, b_{Ns}; k_a$). The sample size $n_{Ts} = m b_{Ns} = (2) (2515) = 5030$. Thus, for the requirement, the SSQSVSS ($n_{Ts}, b_{Ns}; k_a$) id specified by the parameters, $n_{Ts} = 5030$, $b_{Ns} = 2515$ and $k_a = 3.620$. 
Where  
\[ P_N = \phi(w_N) = \text{pr}[(U-x)/\sigma > k_{N\sigma}] \]
and  
\[ P_T = \phi(w_T) = \text{pr}[(U-x)/\sigma > k_{T\sigma}] \]

Equation (8) is the formula for finding the sample size of a known \( \sigma \) SSQSVS system. With the values of \( n \) obtained from (14), it is then checked to see whether the assumed value of \( p_m \) corresponds to the proportion non-conforming at which the SSAOQL occurs or not. That is, it is checked to see whether or not the trial value of \( p_m \) satisfies the following condition.

\[
\text{AOQL} - p_m^*(1 - P_N + P_T)\sqrt{(n_{T\sigma}exp(v_m^2 - W_T^2))} - \\
P_T(\sqrt{(n_{N\sigma}exp(v_m^2 - W_N^2))} - \sqrt{(n_{T\sigma}exp(v_m^2 - W_T^2)}/(1 - P_N + P_T^2) = 0)
\]

Equation (8) was obtained from the following relation

\[
\frac{d(\text{SSAOQ})}{dp} = P_s(p) + P_s(p) = 0
\]

In which

\[
\frac{dP_s(P)}{dp} = (1 - P_N + P_T)\sqrt{(n_{T\sigma}exp(v_m^2 - W_T^2))} - \\
P_T(\sqrt{(n_{N\sigma}exp(v_m^2 - W_N^2))} - \sqrt{(n_{T\sigma}exp(v_m^2 - W_T^2))}/(1 - P_N + P_T^2)
\]

If the assumed value of \( p_m \) does not satisfy (10), then another trial value of \( p_m \) is obtained from (10) by numerical methods. The methods of successive substation is often found to give good results and (10) is rewritten for this purpose as

\[
p_m = (-\text{AOQL}) / (p_m((1 - P_N + P_T)\sqrt{(n_{T\sigma}exp(v_m^2 - W_T^2))}) - \\
P_T(\sqrt{(n_{N\sigma}exp(v_m^2 - W_N^2))} - \sqrt{(n_{T\sigma}exp(v_m^2 - W_T^2))}/(1 - P_N + P_T^2)
\]

After determining the next trial value of \( p_m \), again the values of \( v_m, w_N, w_T \) and \( n_s \) are found and the condition (14) rechecked. This iterative procedure continues until the convergence of \( p_m \) is achieved. Then the value of \( k_s \) is obtained from (3) and (4).

For obtaining the values of \( v_s, w_N \) and \( w_T \), the approximation for the ordinate of the cumulative normal distribution available in Abramowitz and Stegun (1972) was used.

The S-method plans matching the \( \sigma \) method plans were obtained using computer search routine through C++ programme. For selected combinations of SSAQL and SSAOQL, Table 1 was constructed following the above iterative procedure.

The iterative procedure given above may also be used to determine a Six Sigma Quick Switching Sampling System for given Six Sigma Indifference Quality Level (SSIQL) and SSAOQL as well as for given Six Sigma Limiting Quality Level (SSLQL) and SSAOQL with appropriate auxiliary variables \( v \), \( w_N \) and \( w_T \).

**Table 1: SSQSVSS with known and unknown \( \sigma \) indexed by SSAQL and SSAOQL (n_T = m_rN, m_s=2)**

<table>
<thead>
<tr>
<th>SSAQL</th>
<th>SSAOQL</th>
<th>n_T</th>
<th>n_S</th>
<th>k</th>
<th>( \sigma ) - level</th>
<th>n_R</th>
<th>n_S</th>
<th>k</th>
<th>( \sigma ) - level</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.000001</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.000002</td>
<td>2138</td>
<td>1069</td>
<td>4.491</td>
<td>4.1</td>
<td>23700</td>
<td>11850</td>
<td>4.491</td>
<td>4.9</td>
</tr>
<tr>
<td></td>
<td>0.000003</td>
<td>1532</td>
<td>766</td>
<td>4.448</td>
<td>4.0</td>
<td>16688</td>
<td>8344</td>
<td>4.448</td>
<td>4.8</td>
</tr>
<tr>
<td></td>
<td>0.000004</td>
<td>1448</td>
<td>724</td>
<td>4.418</td>
<td>4.0</td>
<td>15580</td>
<td>7790</td>
<td>4.418</td>
<td>4.8</td>
</tr>
<tr>
<td></td>
<td>0.000005</td>
<td>1218</td>
<td>609</td>
<td>4.389</td>
<td>3.9</td>
<td>12950</td>
<td>6475</td>
<td>4.389</td>
<td>4.7</td>
</tr>
<tr>
<td></td>
<td>0.000006</td>
<td>996</td>
<td>498</td>
<td>4.368</td>
<td>3.9</td>
<td>10498</td>
<td>5249</td>
<td>4.368</td>
<td>4.6</td>
</tr>
<tr>
<td></td>
<td>0.000007</td>
<td>784</td>
<td>392</td>
<td>4.352</td>
<td>3.8</td>
<td>8209</td>
<td>4104</td>
<td>4.352</td>
<td>4.6</td>
</tr>
<tr>
<td></td>
<td>0.000008</td>
<td>758</td>
<td>379</td>
<td>4.337</td>
<td>3.8</td>
<td>7887</td>
<td>3944</td>
<td>4.337</td>
<td>4.6</td>
</tr>
<tr>
<td></td>
<td>0.000009</td>
<td>556</td>
<td>278</td>
<td>4.323</td>
<td>3.7</td>
<td>5752</td>
<td>2876</td>
<td>4.323</td>
<td>4.5</td>
</tr>
<tr>
<td></td>
<td>0.00001</td>
<td>346</td>
<td>173</td>
<td>4.311</td>
<td>3.5</td>
<td>3564</td>
<td>1781</td>
<td>4.312</td>
<td>4.5</td>
</tr>
<tr>
<td></td>
<td>0.000003</td>
<td>1685</td>
<td>843</td>
<td>4.336</td>
<td>4.1</td>
<td>17528</td>
<td>8764</td>
<td>4.336</td>
<td>4.8</td>
</tr>
<tr>
<td></td>
<td>0.000004</td>
<td>1593</td>
<td>796</td>
<td>4.306</td>
<td>4.0</td>
<td>16360</td>
<td>8180</td>
<td>4.306</td>
<td>4.8</td>
</tr>
<tr>
<td></td>
<td>0.000005</td>
<td>1340</td>
<td>670</td>
<td>4.277</td>
<td>4.0</td>
<td>13595</td>
<td>6797</td>
<td>4.277</td>
<td>4.7</td>
</tr>
<tr>
<td></td>
<td>0.000006</td>
<td>1096</td>
<td>548</td>
<td>4.256</td>
<td>3.9</td>
<td>11019</td>
<td>5509</td>
<td>4.256</td>
<td>4.7</td>
</tr>
<tr>
<td></td>
<td>0.000007</td>
<td>862</td>
<td>431</td>
<td>4.240</td>
<td>3.8</td>
<td>8615</td>
<td>4307</td>
<td>4.240</td>
<td>4.6</td>
</tr>
<tr>
<td></td>
<td>0.000008</td>
<td>834</td>
<td>417</td>
<td>4.225</td>
<td>3.8</td>
<td>8276</td>
<td>4138</td>
<td>4.225</td>
<td>4.6</td>
</tr>
<tr>
<td></td>
<td>0.000009</td>
<td>612</td>
<td>306</td>
<td>4.211</td>
<td>3.7</td>
<td>6034</td>
<td>3017</td>
<td>4.211</td>
<td>4.5</td>
</tr>
<tr>
<td></td>
<td>0.00001</td>
<td>381</td>
<td>190</td>
<td>4.199</td>
<td>3.5</td>
<td>3736</td>
<td>1868</td>
<td>4.200</td>
<td>4.5</td>
</tr>
</tbody>
</table>
Table 1: (continued…)

<table>
<thead>
<tr>
<th>SSAQL</th>
<th>SSAOQL</th>
<th>( n_t )</th>
<th>( n_s )</th>
<th>( k )</th>
<th>( \sigma – \text{level} )</th>
<th>( n_t )</th>
<th>( n_s )</th>
<th>( k )</th>
<th>( \sigma – \text{level} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.000004</td>
<td>0.000008</td>
<td>2101</td>
<td>1051</td>
<td>4.016</td>
<td>4.2</td>
<td>19046</td>
<td>9523</td>
<td>4.016</td>
<td>4.8</td>
</tr>
<tr>
<td>0.000009</td>
<td>1541</td>
<td>771</td>
<td>4.001</td>
<td>4.1</td>
<td>13787</td>
<td>6939</td>
<td>4.001</td>
<td>4.8</td>
<td></td>
</tr>
<tr>
<td>0.00001</td>
<td>959</td>
<td>480</td>
<td>3.987</td>
<td>3.9</td>
<td>8583</td>
<td>4291</td>
<td>3.987</td>
<td>4.6</td>
<td></td>
</tr>
<tr>
<td>0.00002</td>
<td>316</td>
<td>158</td>
<td>3.975</td>
<td>3.5</td>
<td>2813</td>
<td>1406</td>
<td>3.976</td>
<td>4.5</td>
<td></td>
</tr>
<tr>
<td>0.000005</td>
<td>0.000006</td>
<td>7731</td>
<td>3865</td>
<td>3.941</td>
<td>4.6</td>
<td>67767</td>
<td>33884</td>
<td>3.941</td>
<td>5.2</td>
</tr>
<tr>
<td>0.000007</td>
<td>6085</td>
<td>3043</td>
<td>3.920</td>
<td>4.5</td>
<td>52840</td>
<td>26420</td>
<td>3.920</td>
<td>5.1</td>
<td></td>
</tr>
<tr>
<td>0.000008</td>
<td>5883</td>
<td>2942</td>
<td>3.904</td>
<td>4.5</td>
<td>50720</td>
<td>25360</td>
<td>3.904</td>
<td>5.1</td>
<td></td>
</tr>
<tr>
<td>0.000009</td>
<td>4315</td>
<td>2158</td>
<td>3.889</td>
<td>4.4</td>
<td>36951</td>
<td>18476</td>
<td>3.889</td>
<td>5.0</td>
<td></td>
</tr>
<tr>
<td>0.00001</td>
<td>2686</td>
<td>1343</td>
<td>3.875</td>
<td>4.3</td>
<td>22849</td>
<td>11424</td>
<td>3.875</td>
<td>4.9</td>
<td></td>
</tr>
<tr>
<td>0.00002</td>
<td>885</td>
<td>442</td>
<td>3.863</td>
<td>3.9</td>
<td>7487</td>
<td>3744</td>
<td>3.863</td>
<td>4.6</td>
<td></td>
</tr>
<tr>
<td>0.00003</td>
<td>714</td>
<td>357</td>
<td>3.781</td>
<td>3.8</td>
<td>5818</td>
<td>2909</td>
<td>3.781</td>
<td>4.5</td>
<td></td>
</tr>
<tr>
<td>0.00004</td>
<td>605</td>
<td>303</td>
<td>3.732</td>
<td>3.7</td>
<td>4822</td>
<td>2411</td>
<td>3.732</td>
<td>4.5</td>
<td></td>
</tr>
<tr>
<td>0.00005</td>
<td>481</td>
<td>241</td>
<td>3.695</td>
<td>3.7</td>
<td>3766</td>
<td>1883</td>
<td>3.696</td>
<td>4.5</td>
<td></td>
</tr>
<tr>
<td>0.0001</td>
<td>973</td>
<td>487</td>
<td>3.751</td>
<td>3.9</td>
<td>7821</td>
<td>3910</td>
<td>3.751</td>
<td>4.6</td>
<td></td>
</tr>
<tr>
<td>0.00003</td>
<td>785</td>
<td>393</td>
<td>3.669</td>
<td>3.9</td>
<td>6073</td>
<td>3036</td>
<td>3.669</td>
<td>4.5</td>
<td></td>
</tr>
<tr>
<td>0.00004</td>
<td>666</td>
<td>333</td>
<td>3.620</td>
<td>3.8</td>
<td>5030</td>
<td>2515</td>
<td>3.620</td>
<td>4.5</td>
<td></td>
</tr>
<tr>
<td>0.00005</td>
<td>529</td>
<td>265</td>
<td>3.583</td>
<td>3.7</td>
<td>3927</td>
<td>1964</td>
<td>3.584</td>
<td>4.5</td>
<td></td>
</tr>
<tr>
<td>0.00006</td>
<td>1608</td>
<td>804</td>
<td>3.377</td>
<td>4.1</td>
<td>10779</td>
<td>5390</td>
<td>3.377</td>
<td>4.7</td>
<td></td>
</tr>
<tr>
<td>0.00007</td>
<td>1272</td>
<td>636</td>
<td>3.355</td>
<td>4.1</td>
<td>8430</td>
<td>4215</td>
<td>3.355</td>
<td>4.7</td>
<td></td>
</tr>
<tr>
<td>0.00008</td>
<td>1003</td>
<td>501</td>
<td>3.335</td>
<td>4.0</td>
<td>6580</td>
<td>3290</td>
<td>3.335</td>
<td>4.6</td>
<td></td>
</tr>
<tr>
<td>0.00009</td>
<td>659</td>
<td>330</td>
<td>3.301</td>
<td>3.8</td>
<td>4252</td>
<td>2126</td>
<td>3.302</td>
<td>4.5</td>
<td></td>
</tr>
<tr>
<td>0.001</td>
<td>505</td>
<td>252</td>
<td>2.969</td>
<td>3.8</td>
<td>2729</td>
<td>1365</td>
<td>2.970</td>
<td>4.5</td>
<td></td>
</tr>
</tbody>
</table>

Table 2: \( P_s(p_s) \) Values of known \( \sigma \) plans

<table>
<thead>
<tr>
<th>SSAQL</th>
<th>SSAOQL</th>
<th>( n_t )</th>
<th>( n_s )</th>
<th>( k )</th>
<th>( \sigma – \text{level} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.000002</td>
<td>0.000001</td>
<td>0.000003</td>
<td>0.000004</td>
<td>0.000005</td>
<td>0.00001</td>
</tr>
<tr>
<td>0.91</td>
<td>0.89</td>
<td>0.84</td>
<td>0.84</td>
<td>0.81</td>
<td>0.78</td>
</tr>
</tbody>
</table>

References