$$\nabla g(a,b) = \left(-f_{\chi^2_{2n}}(a),\ f_{\chi^2_{2n}}(b)\right)$$ que es linealmente independiente y

$$\nabla L(a,b) = \left(\frac{1}{2\sum_{i=1}^{n} Ln(X_i)}, -\frac{1}{2\sum_{i=1}^{n} Ln(X_i)} \right)$$

$$\Rightarrow \nabla L(a,b) = \lambda \nabla g(a,b)$$, esto es:

$$\begin{cases} +\dfrac{1}{2\sum_{i=1}^{n} Ln(X_i)} = -\lambda f_{\chi^2_{2n}}(a) \\ -\dfrac{1}{2\sum_{i=1}^{n} Ln(X_i)} = \lambda f_{\chi^2_{2n}}(b) \\ F_{\chi^2_{2n}}(b) - F_{\chi^2_{2n}}(a) - 1 + \alpha = 0 \end{cases} \Rightarrow \begin{array}{c} f_{\chi^2_{2n}}(a) = f_{\chi^2_{2n}}(b) \\ \text{y} \\ F_{\chi^2_{2n}}(b) - F_{\chi^2_{2n}}(a) - 1 + \alpha = 0 \end{array}$$

Por tanto para un α dado existirán unos únicos $a_0, b_0 > 0$ que verifiquen $f_{\chi^2_{2n}}(a_0) = f_{\chi^2_{2n}}(b_0)$ y $F_{\chi^2_{2n}}(a_0) - F_{\chi^2_{2n}}(b_0) = 1-\alpha$.
Estos a_0 y b_0 determinan el intervalo de confianza de longitud mínima que será:

$$\boxed{IC_{1-\alpha}(\theta) = \left(-\frac{a_0}{2\sum_{i=1}^{n} Ln(X_i)}, -\frac{b_0}{2\sum_{i=1}^{n} Ln(X_i)} \right)}$$