Calculation of the vacuum Green's function valid for high toroidal mode number in tokamaks.[1] MORRELL CHANCE, Princeton Plasma Physics Lab, ALAN TURNBULL, PHILIP SNYDER, General Atomics — The present evaluation of the Green's function used for the magmetic scalar potential in vacuum calculations for axisymmetric geometry in the vacuum segments of GATO, PEST and other MHD stability codes has been found to be deficient for moderately high toroidal mode numbers. This was due to the loss of numerical precision arising from the upward recursion relation used for generating the functions to high mode numbers. The recursion is initiated from the complete elliptic integrals of the first and second kinds. To ameliorate this, a direct integration of the integral representation of the function was crafted to achieve the necessary high accuracy for moderately high mode numbers. At very high mode numbers the loss of numerical precision due to the oscillatory behavior of the integrand is further avoided by judiciously deforming the integration contour in the complex plane. Machine precision, roughly $14 - 16$ digits, accuracy can be achieved by using a combination of both these techniques.

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