

Statement about power capability

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The United States specifically starts restrictions for output power of an RF transistor at 3.2 GHz. The requirement is that discrete microwave transistors from 3.2 to 6.8 GHz that exceed 60 watts are subject to export control at a power level of 60 watts. The power level that triggers export control gradually decreases with frequency, as transistors possess a natural reduction in power capability as frequency. See "Commerce Control List Supplement No. 1 to Part 774, Category 3", page 6, from Export Administration Regulations Bureau of Industry and Security December 7, 2012. This document is available on the Department of Commerce websiteⁱ

b.3. Discrete microwave transistors having any of the following:

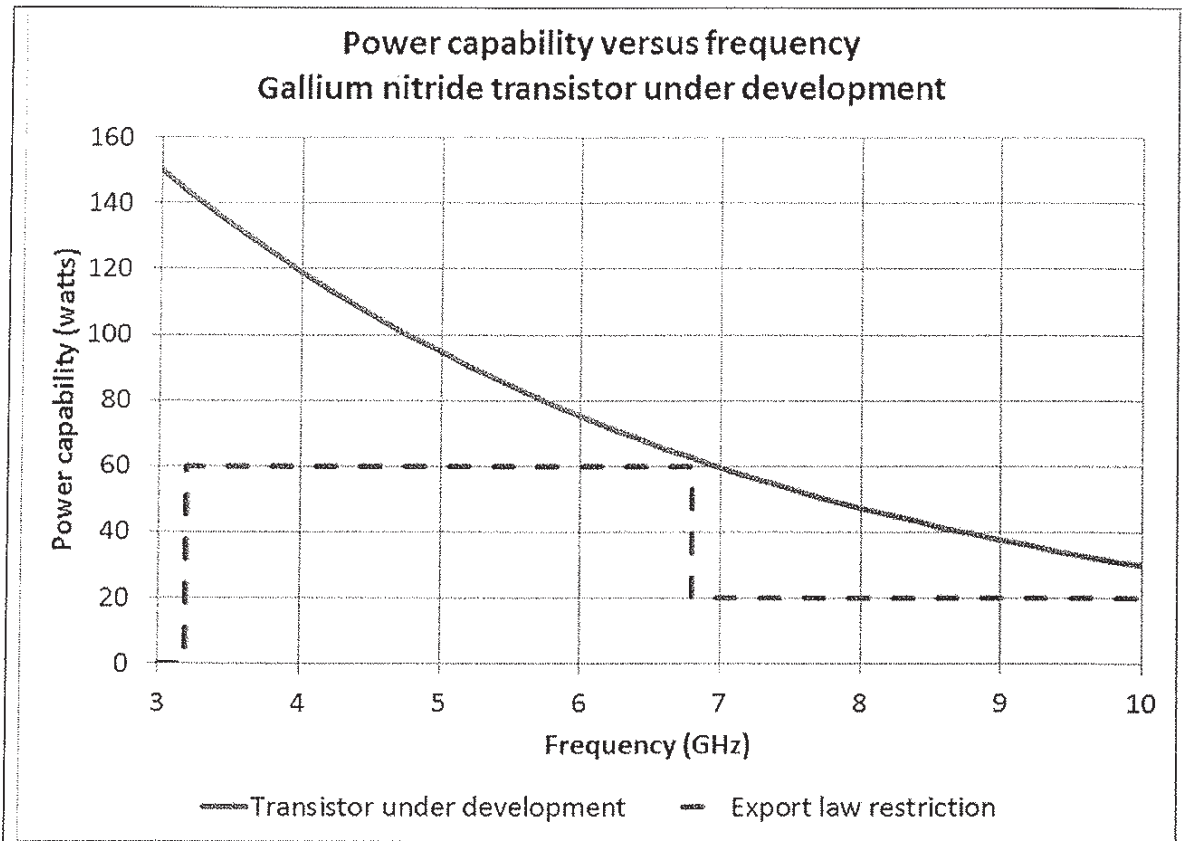
b.3.a. Rated for operation at frequencies exceeding 3.2 GHz up to and including 6.8 GHz and having an average output power greater than 60W (47.8 dBm);

The next frequency band defined for export control is 6.8 to 31.8 GHz, where 20 watts is the boundary.

The specification found on Shane's hard drive calls for a 150 watt transistor at 3 GHz. Such a transistor naturally would also be capable of close to 150 watts at 3.2 GHz and therefore an export violation. One convenient way to approximately scale the power capability of a transistor is to project that it scales down by a factor of two for every doubling in frequency. On the plot I supplied, this relationship shows that a 150 watt, 3 GHz transistor is capable of 143 watts at 3.2 GHz, 137 watts at 3.4 GHz, etc. (blue line). It far exceeds the defined boundary for export control (red line on the plot) across the 3.2 to 6.8 GHz band and into the 6.8 to 31.8 GHz band.

To me, that 150 watt/3 GHz specification was written to deliberately skirt United States export controls in order to obtain very high power capability.

If Shane were to look up the export control on microwave transistors, he would have seen that 60 watts/3 GHz is the nearest threshold. Shane had superior knowledge of gallium nitride power transistors, it would have been obvious to him that the 150 watt transistor they were developing far exceeds the power threshold in the frequency band 3.2 to 6.8 GHz. Thus he would have surmised that developing a transistor with very high power capability at 3 GHz would put himself and Veeco in direct violation of export laws.



¹ <http://www.bis.doc.gov/policiesandregulations/ear/ccl3.pdf>