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TRU BMMA Products Test Report

Objective

Verify the durability of TRU BMMA connector products over extended cycling of mating and unmating. The process is meant to simulate the lifetime mating of the connectors and to measure the effects on the electrical and mechanical performance. Parameters measured were VSWR, insertion loss, insertion force, extraction force, and RF leakage.

Test Samples

A quantity of 6 samples consisting of 2 cable assemblies (which will be referred to as Qual. Samples) were built with the following configuration:

Cable A

Conn. 1: SMA(f) BHD (TRU-7118)
Conn. 2: BMMA(f) Jack (TRU-9845-GGU)
Cable: .141 Semi-Rigid (M17/130-00005)
Length: 4 inches

Cable B

Conn. 1: SMA(m) Plug (TRU-7114)
Conn. 2: BMMA(m) Plug (TRU-9843-GGU)
Cable: .141 Semi-Rigid (M17/130-00005)
Length: 6 inches

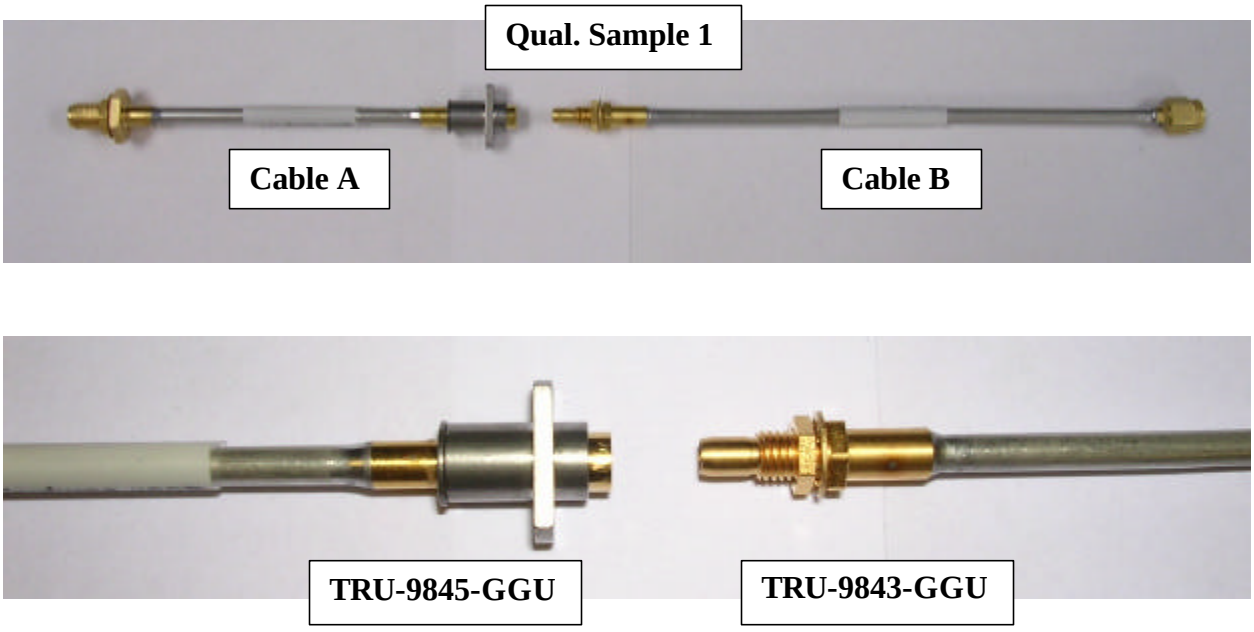

Figure 1
BMMA Jack and Plug assemblies.

Baseline Testing

Mechanical and electrical tests were performed on the sample assemblies to establish the baseline values before commencing cycling.

The electrical tests were performed in the configuration shown in *Figure 2*. The BMMA Jack and BMMA Plug were placed in a fixture to attain .030" of compression on the BMMA Jack Spring and tested as a mated pair. A full 2-port 3.5mm calibration was performed and measurements were taken from .05GHz to 10.0 GHz.

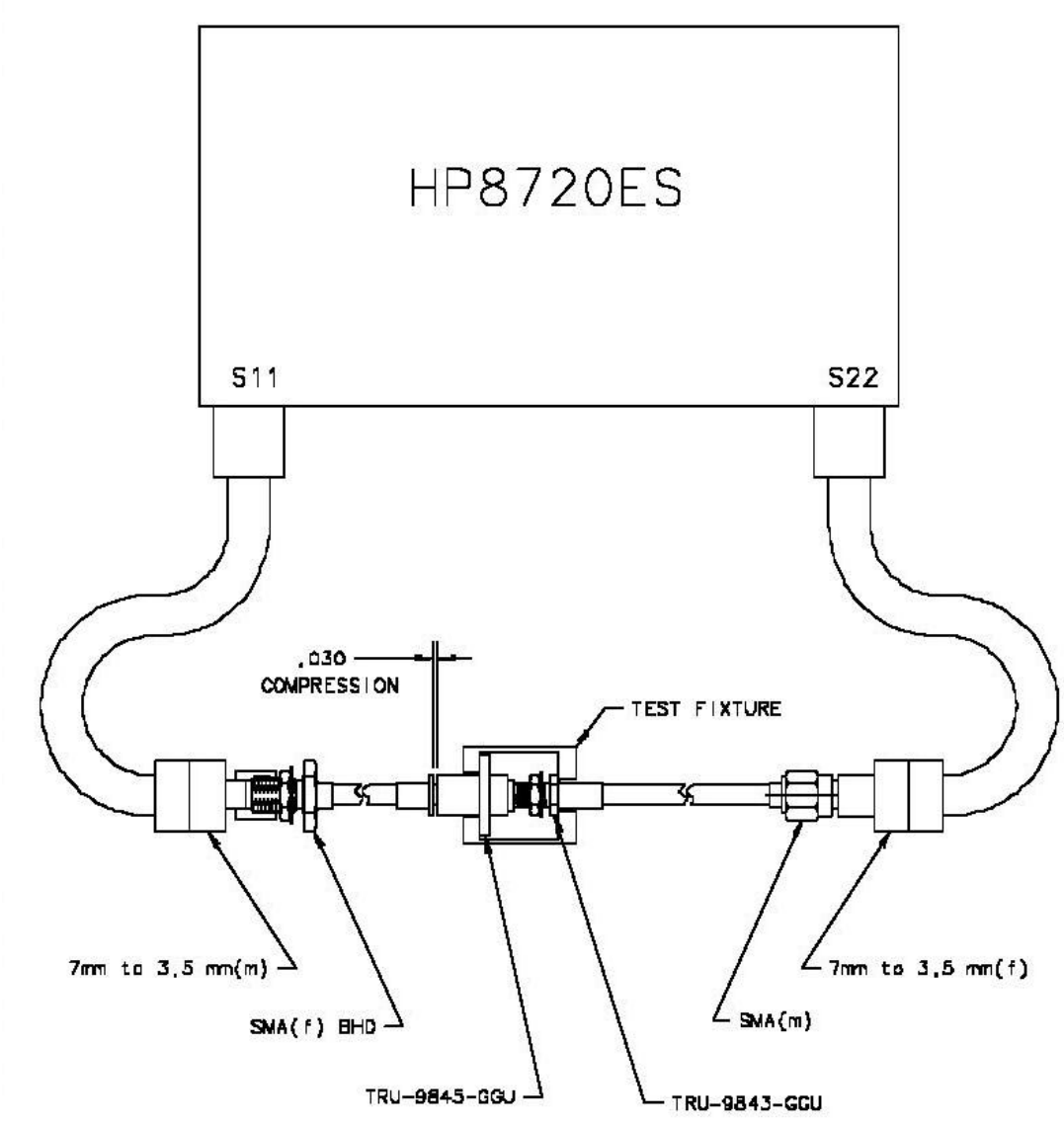

Figure 2
Electrical Test Setup.

Mechanical Testing

The mechanical tests for insertion and extraction forces were taken using the configuration shown in *Figure 3*. Refer to *Table 1* for the results of the baseline testing.

Figure 3
Mechanical Test Setup.

Mating/Unmating Cycling

The cycling of the connector mating was performed using the fixture shown in *Figures 4*, *5*, and *6*. **Cable B** was mounted in a fixed position and **Cable A** was moved forward to engage the connector interface. Qual. Samples 1-5 were mated at the rate of approximately 12 mating cycles per minute. During the test sequence, the assemblies were monitored for continuity to ensure that mating had occurred. The samples were tested in 500 cycle increments up to 10,000 mate/unmate cycles*. After every 500 cycles, measurements were taken for VSWR, insertion loss, insertion force, and extraction force. RF leakage measurements were taken at baseline and at 1,000 cycles*.

* BMMA connectors are rated for 1,000 mating durability cycles.

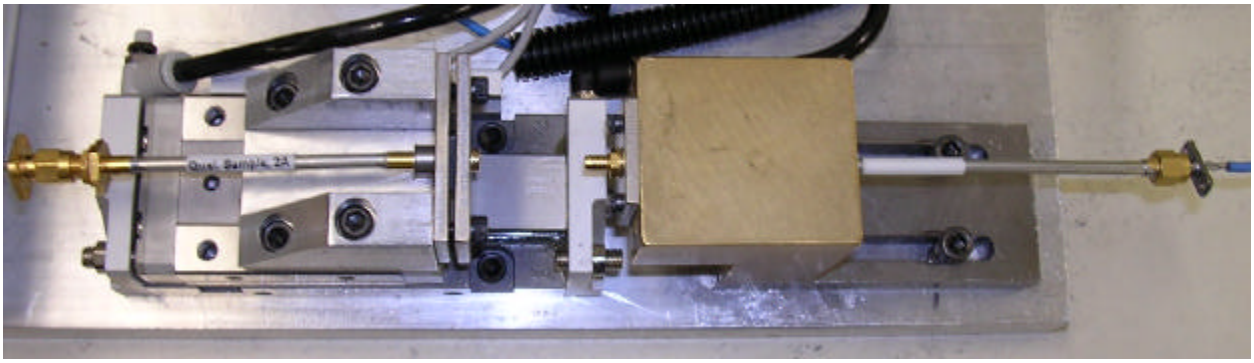

Figure 4
Test Sample in fixture. Unmated.

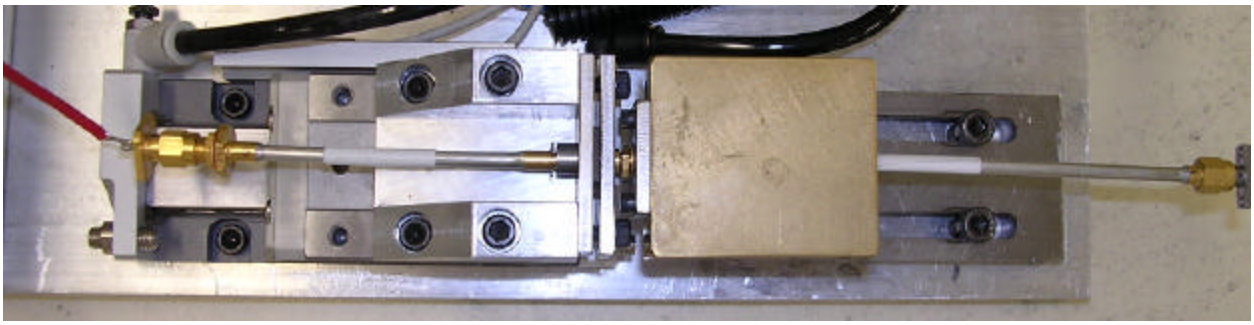

Figure 5
Test Sample in fixture. Mated.

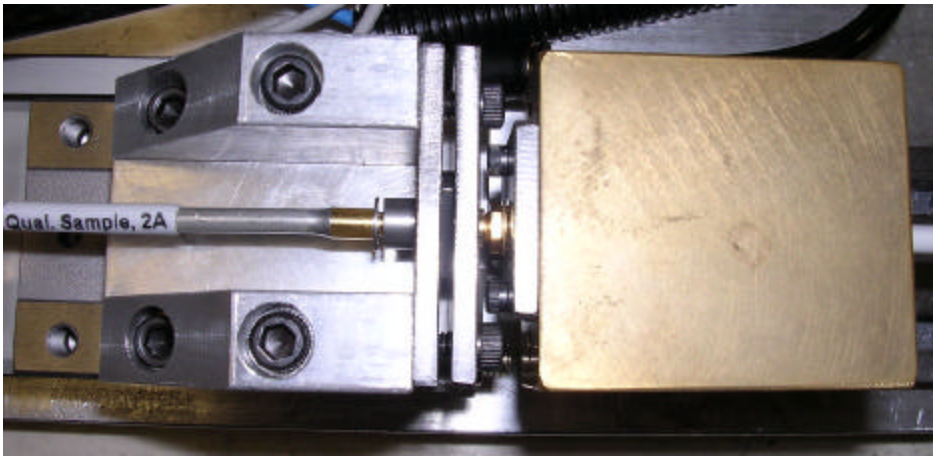

Figure 6
Mated close-up.

Results

The results from each test sample are shown in Table 1. The test results indicate that the electrical/mechanical parameters remained well within all performance limits. The results also demonstrate that the BMMA interface operated with no significant degradation well beyond its rating of 1,000 mating cycles. Averages were taken of the data points for the 5 samples and plotted versus the number of mates, see figures 7-10. A separate sample was cycled for 20,000 cycles to evaluate the product over an extended life. The VSWR and Insertion loss plots are attached for this sample. This extended cycling would not be recommended for full broadband applications but indicate that in the lower frequency bands, the performance parameters are still within acceptable limits.

		Insertion Force (lbs.)	Extraction Force (lbs.)	VSWR Max.	Insertion Loss Max (dB)
Sample 1	Baseline	0.60	0.40	1.1465	-.452
	After 5,000 cycles	0.05	0.05	1.1483	-.442
	After 10,000 cycles	0.05	0.05	1.1593	-.494
Sample 2	Baseline	0.40	0.30	1.1243	-.451
	After 5,000 cycles	0.05	0.05	1.1066	-.475
	After 10,000 cycles	0.05	0.05	1.1061	-.465
Sample 3	Baseline	0.30	0.20	1.1541	-.451
	After 5,000 cycles	0.05	0.05	1.1489	-.470
	After 10,000 cycles	0.05	0.05	1.1606	-.463
Sample 4	Baseline	0.30	0.10	1.1859	-.537
	After 5,000 cycles	0.05	0.05	1.1811	-.558
	After 10,000 cycles	0.05	0.05	1.1787	-.569
Sample 5	Baseline	0.50	0.30	1.1672	-.438
	After 5,000 cycles	0.20	0.10	1.1560	-.476
	After 10,000 cycles	0.20	0.10	1.1241	-.451

Table 1
Qual. Sample Summary Data.

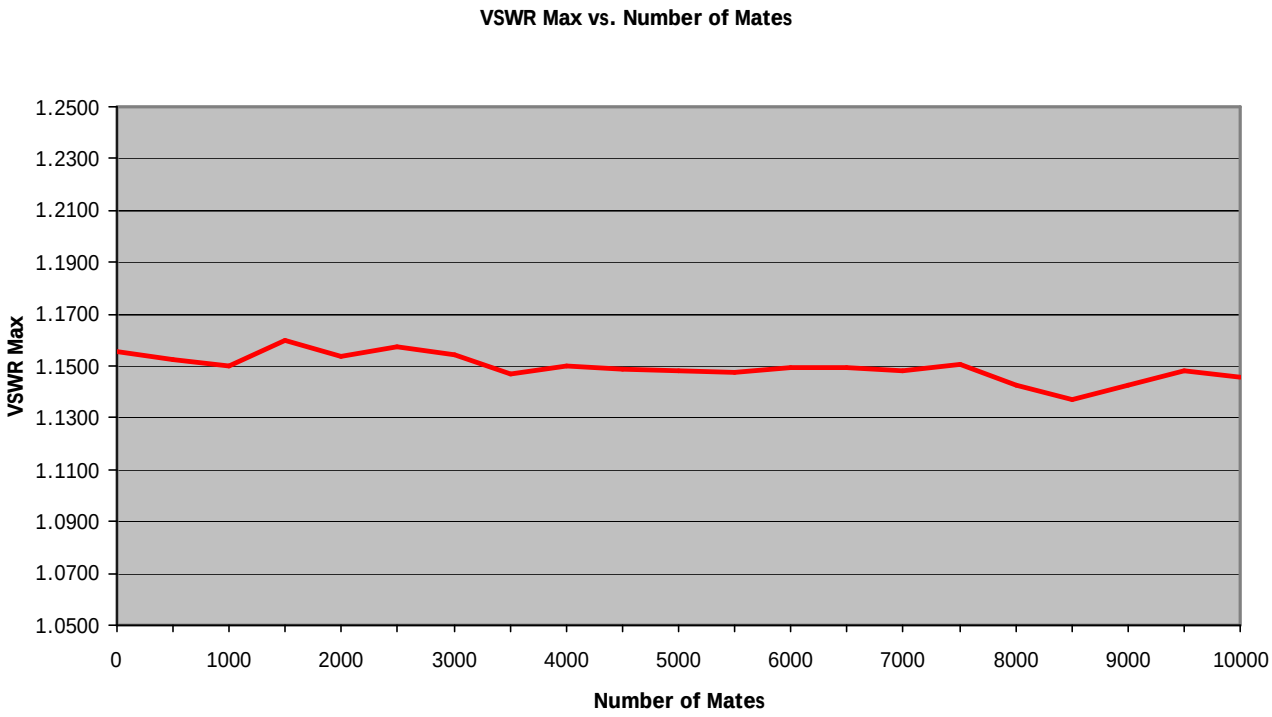
VSWR Max vs. Number of Mates
1.2500
1.2300
1.2100
1.1900
1.1700
1.1500
1.1300
1.1100
1.0900
1.0700
1.0500
VSWR Max
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
Number of Mates

Figure 7

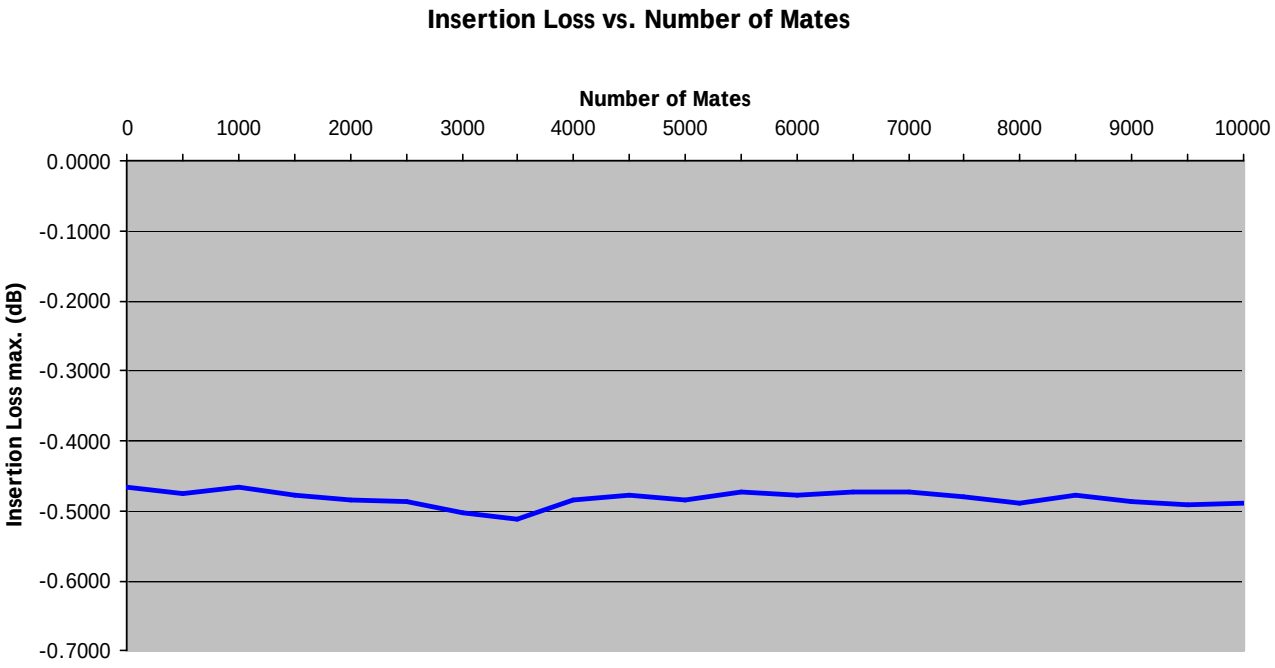

Figure 8
Average Insertion Loss vs. Number of Mates.

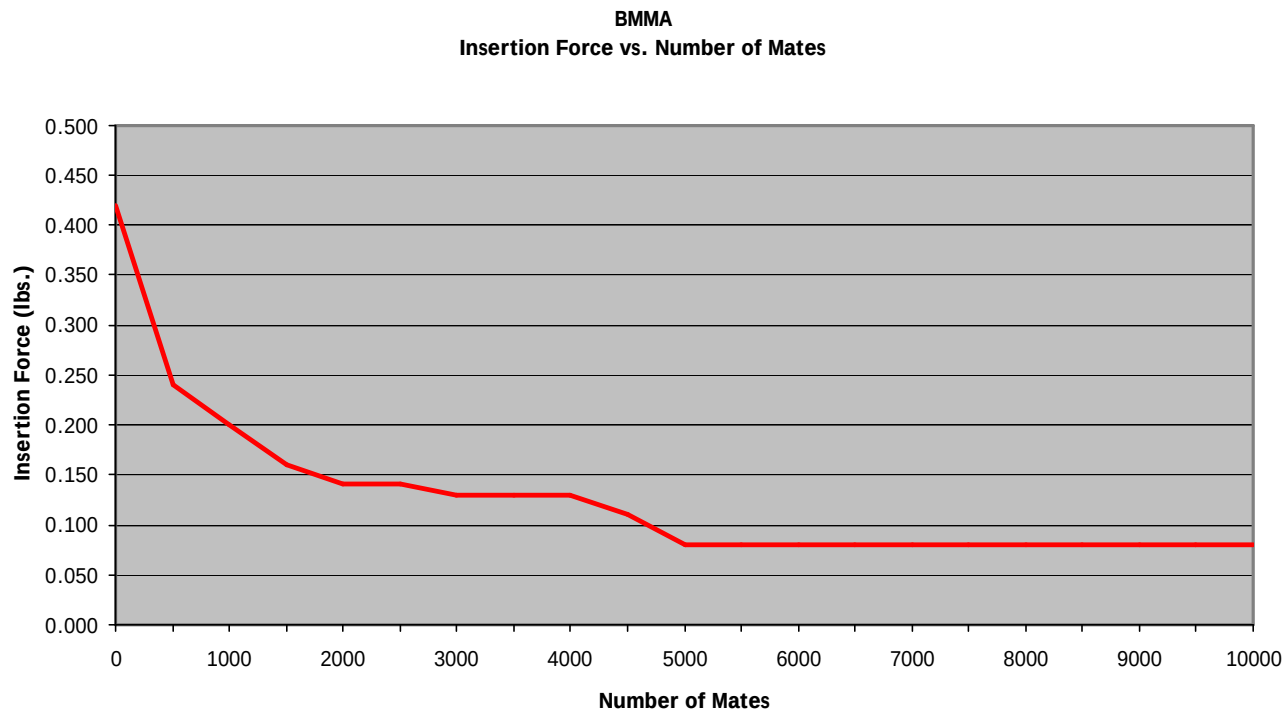

Figure 9
Insertion Force vs. Number of Mates.

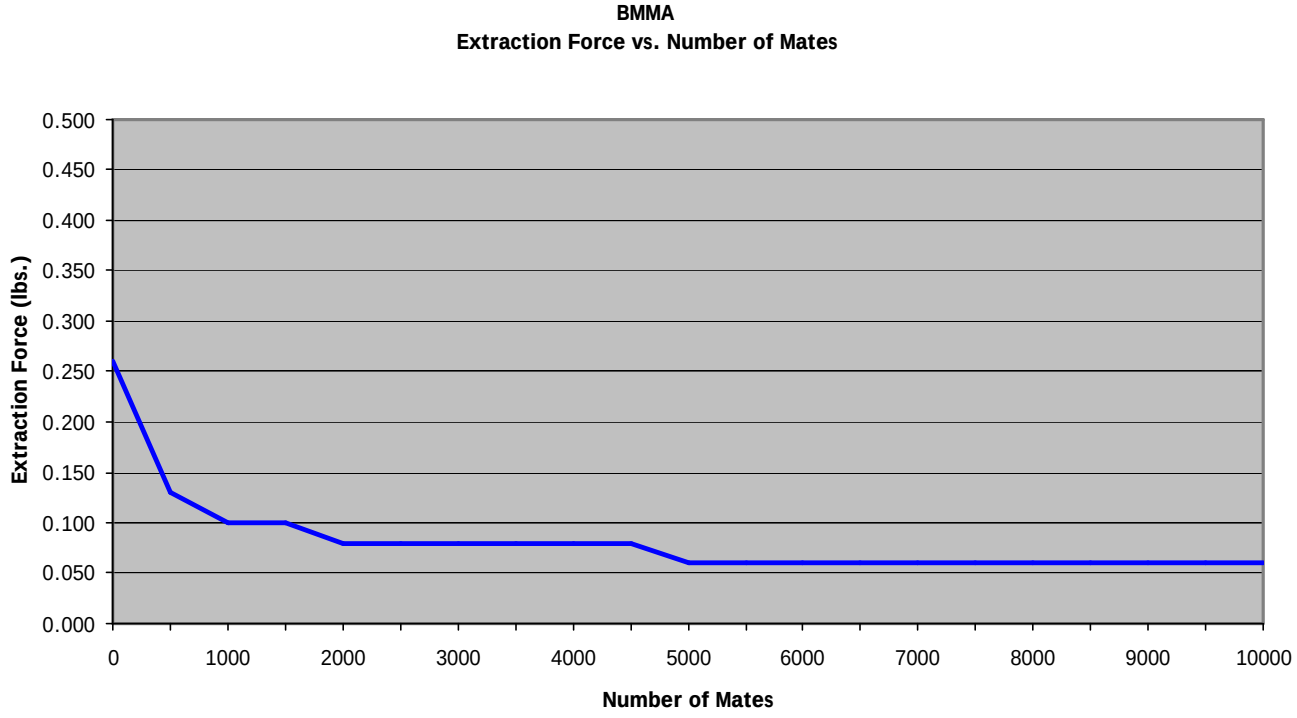

Figure 10
Extraction Force vs. Number of Mates.