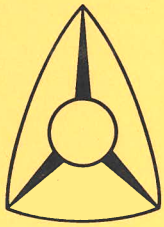

OSA

DESIGN CENTERING USING TOLCAD, PART II: MONTE CARLO AND VERTEX ANALYSES

OSA-86-TC-8-R

November 12, 1986

Optimization Systems Associates

163 Watson's Lane, Dundas, Ontario, Canada

DESIGN CENTERING USING TOLCAD,

PART II: MONTE CARLO

AND VERTEX ANALYSES

OSA-86-TC-8-R

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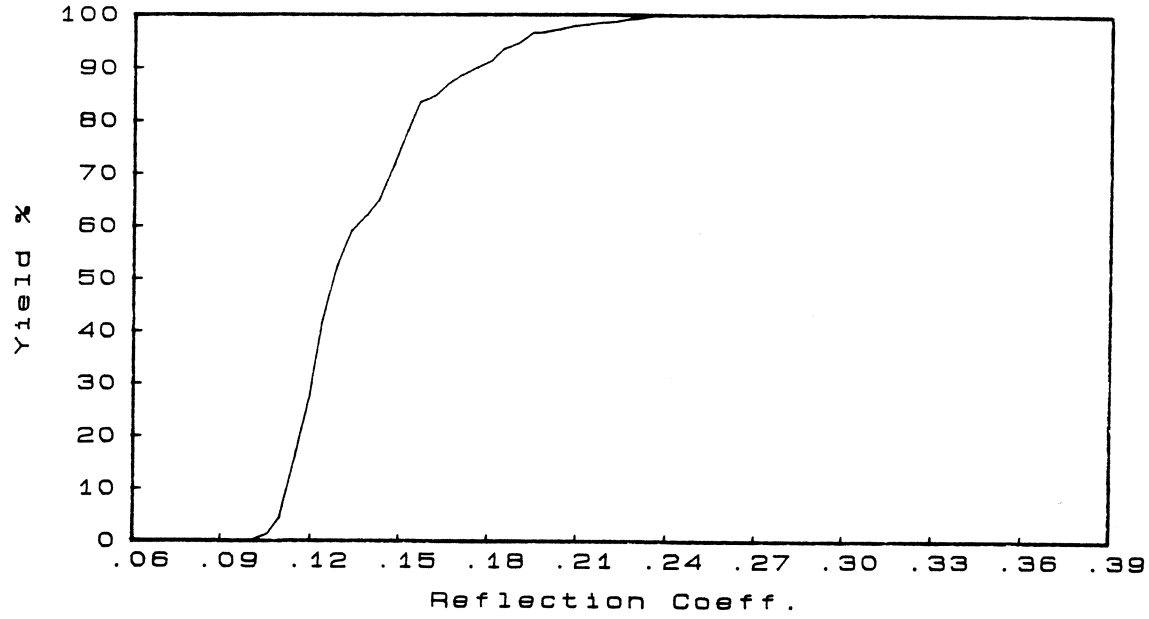
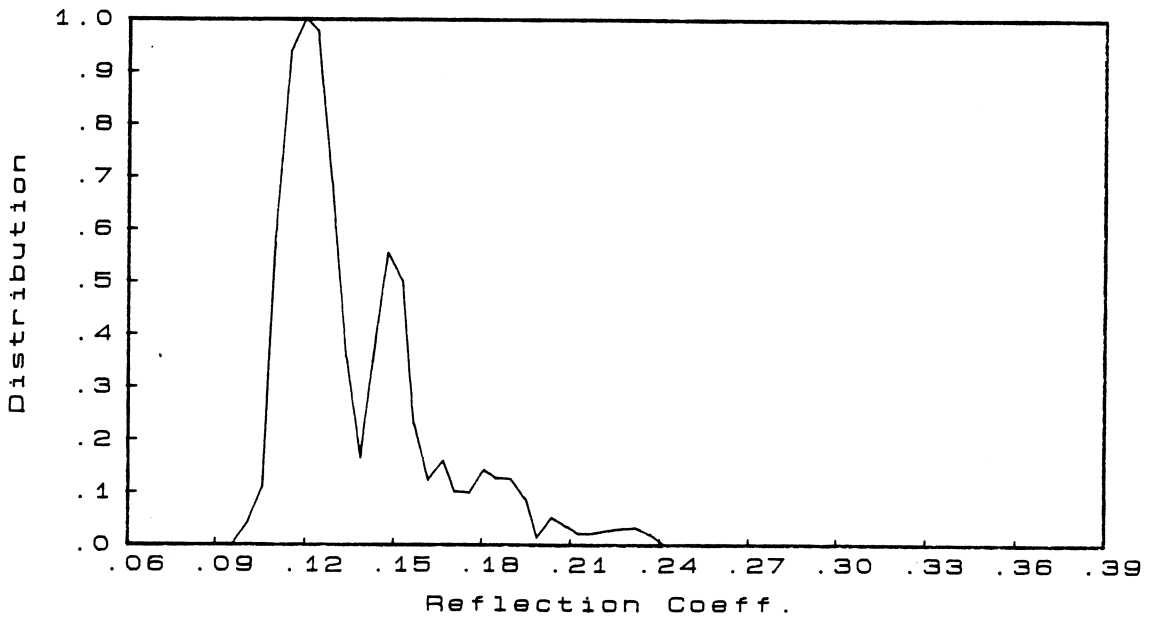
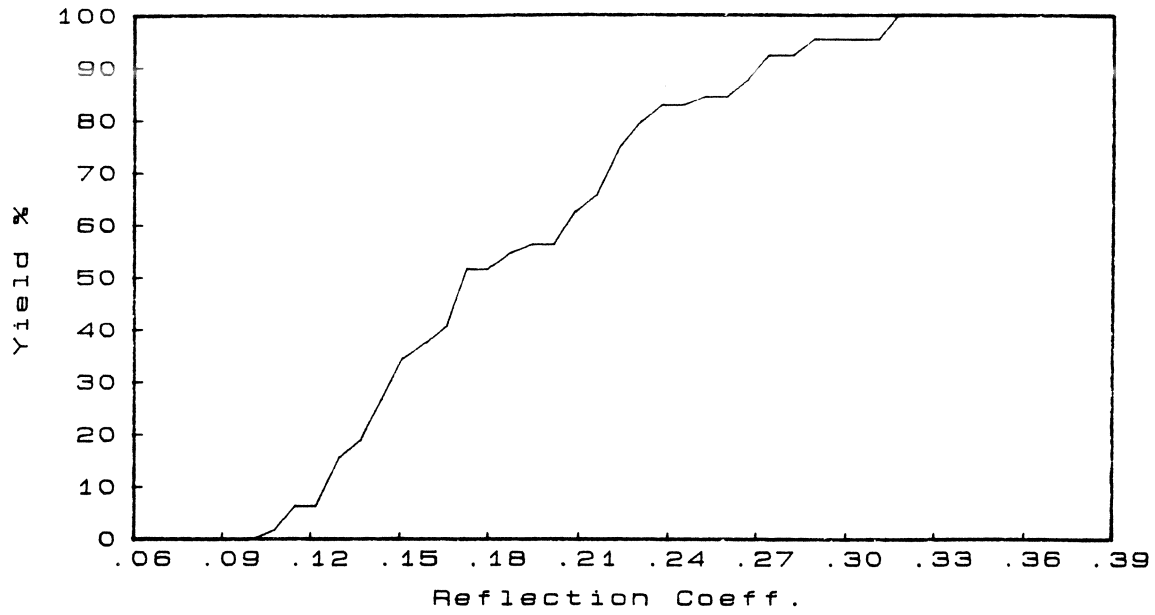
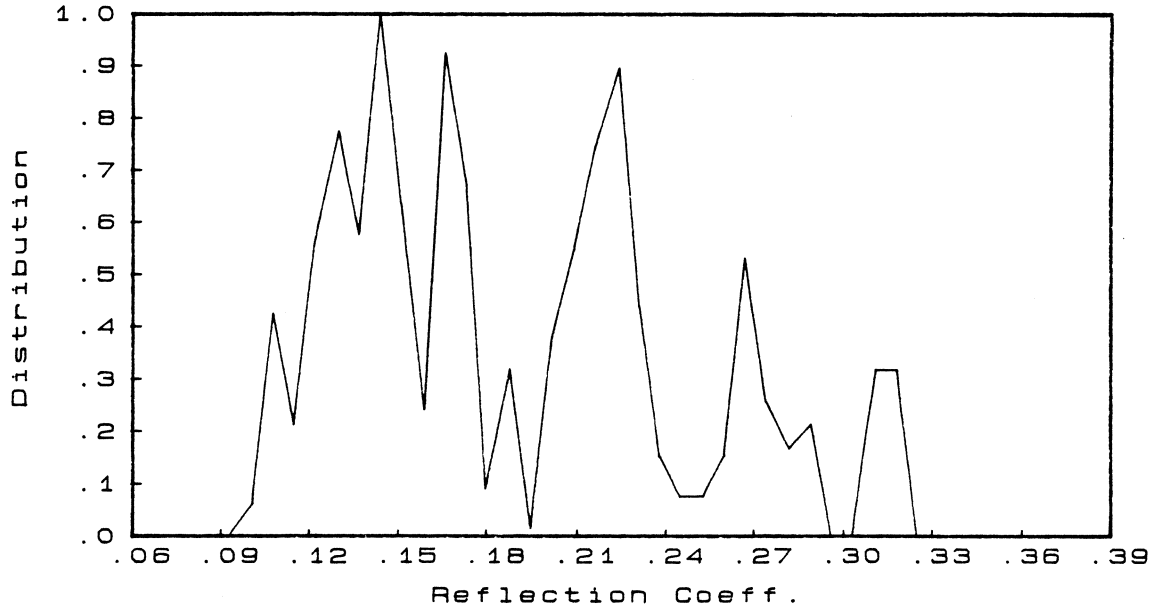




FILE: MCNOM
RANGES OF REFLECTION COEFFICIENTS : .1010 .2369

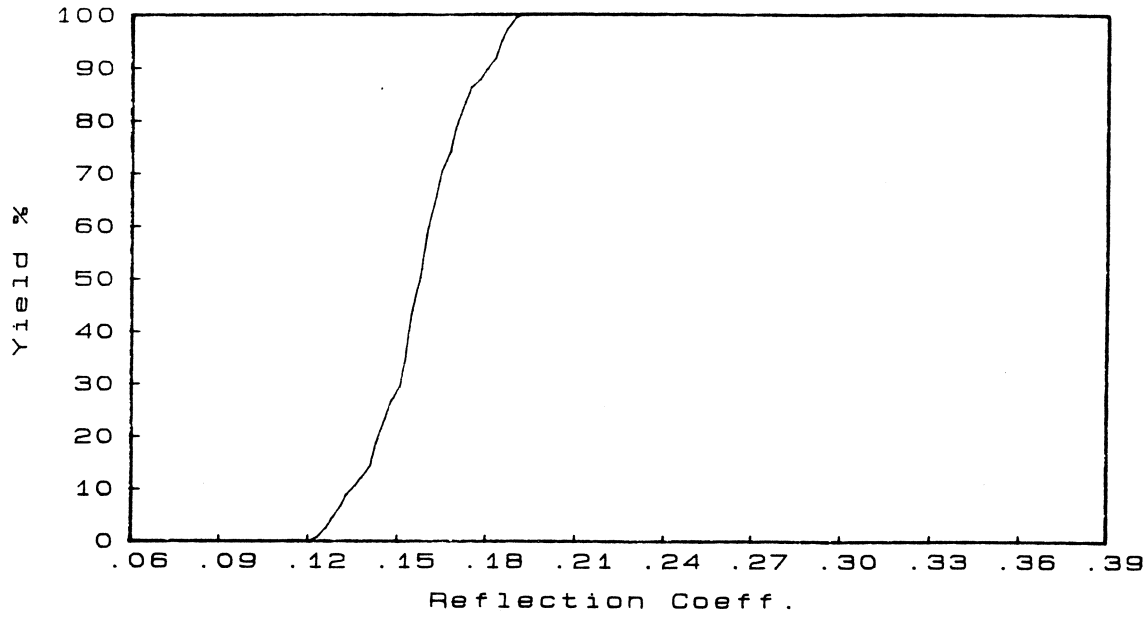
Fig. 1 Monte Carlo analysis for the conventional nominal design obtained using a least squares objective function with zero tolerances.

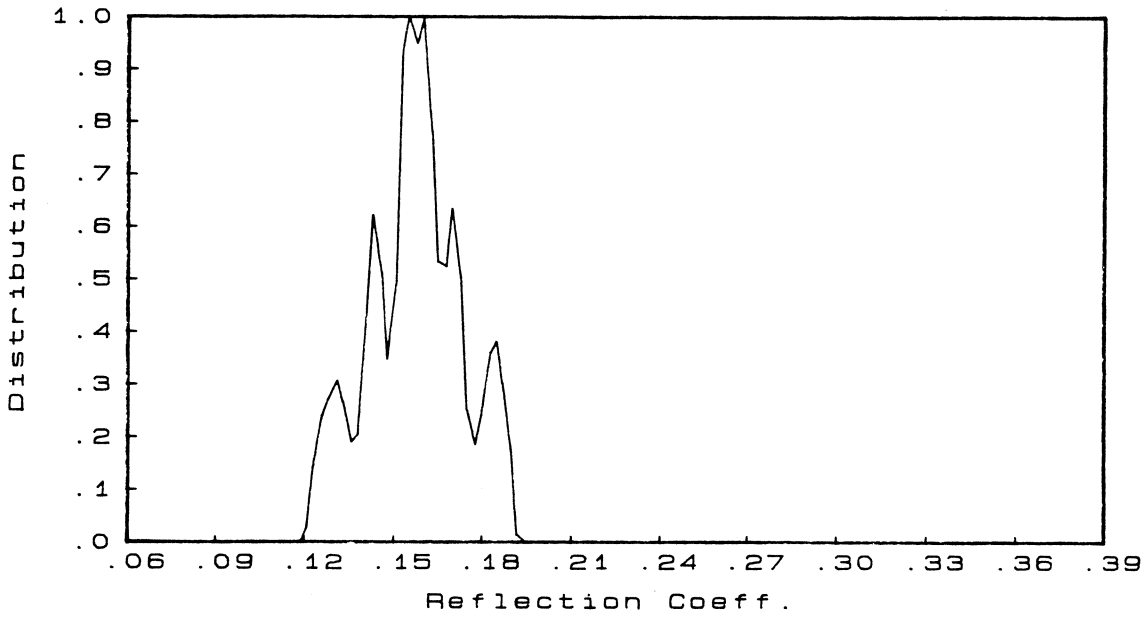




FILE: VANOM
RANGES OF REFLECTION COEFFICIENTS : .1078 .3178

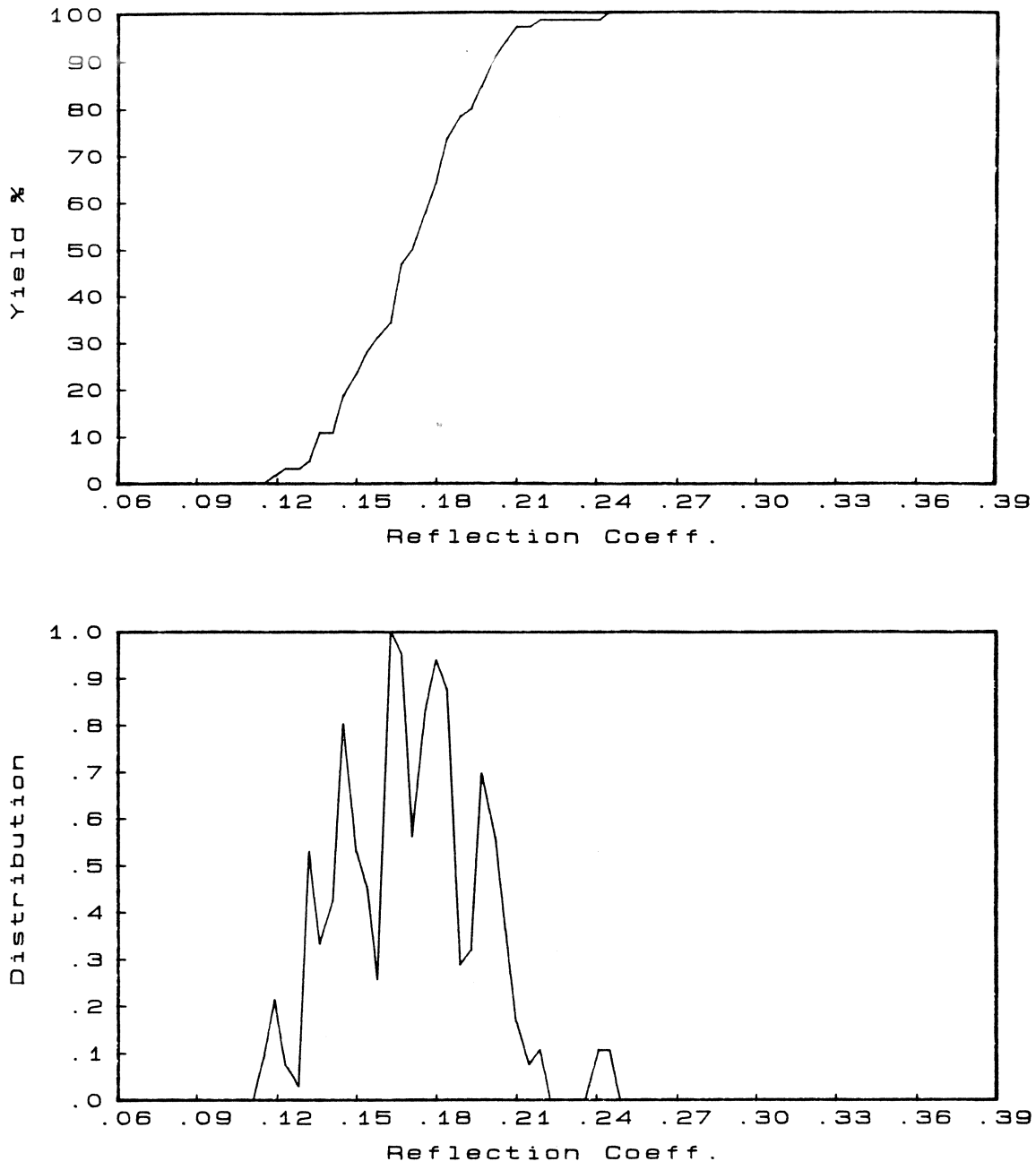
Fig. 2 Vertex analysis for the conventional nominal design obtained using a least squares objective function with zero tolerances.





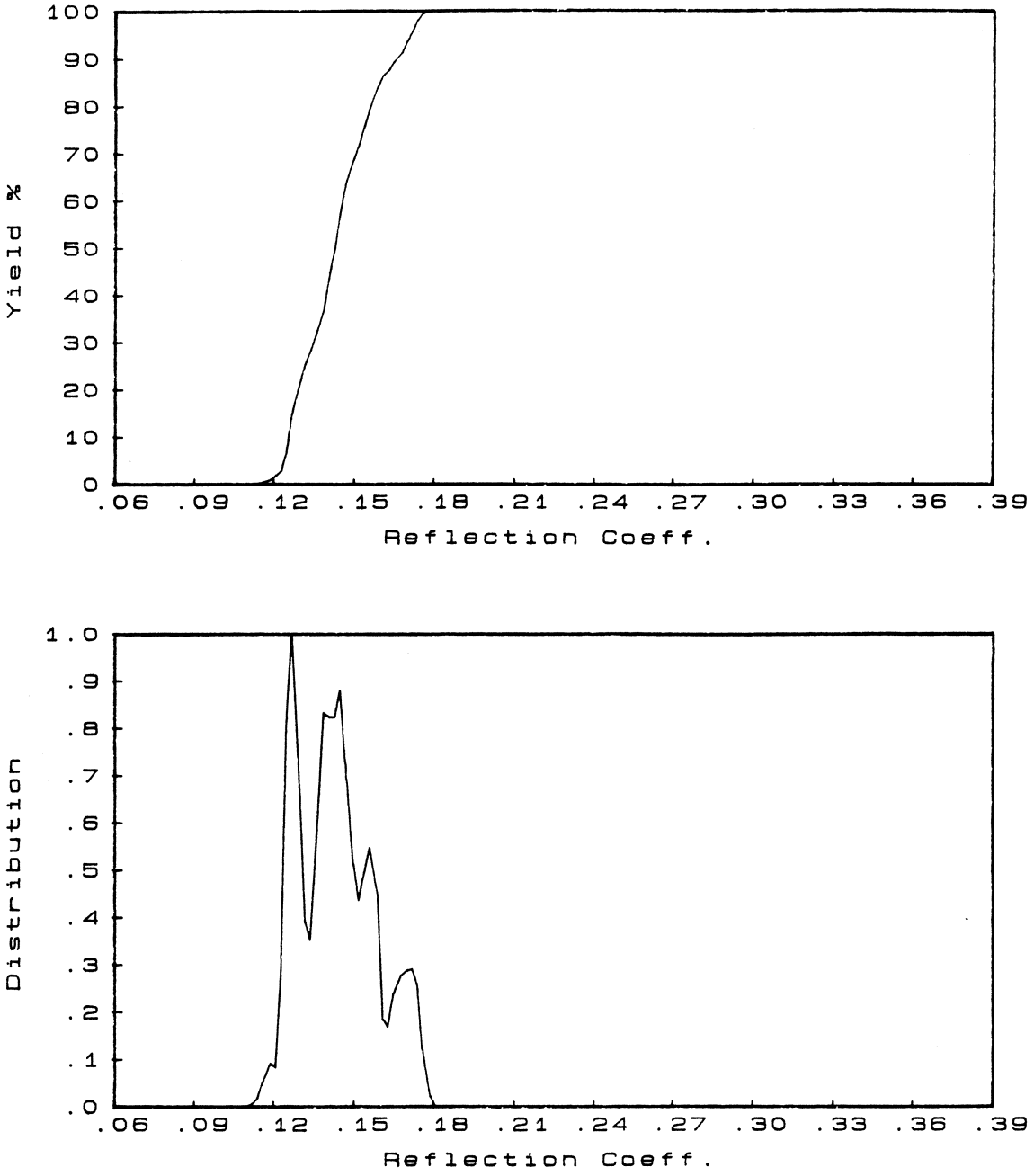
FILE: MCOAF21
RANGES OF REFLECTION COEFFICIENTS : .1210 .1924

Fig. 3 Monte Carlo analysis of the solution to the FTP obtained using all vertices of the tolerance region and 21 sample frequency points.



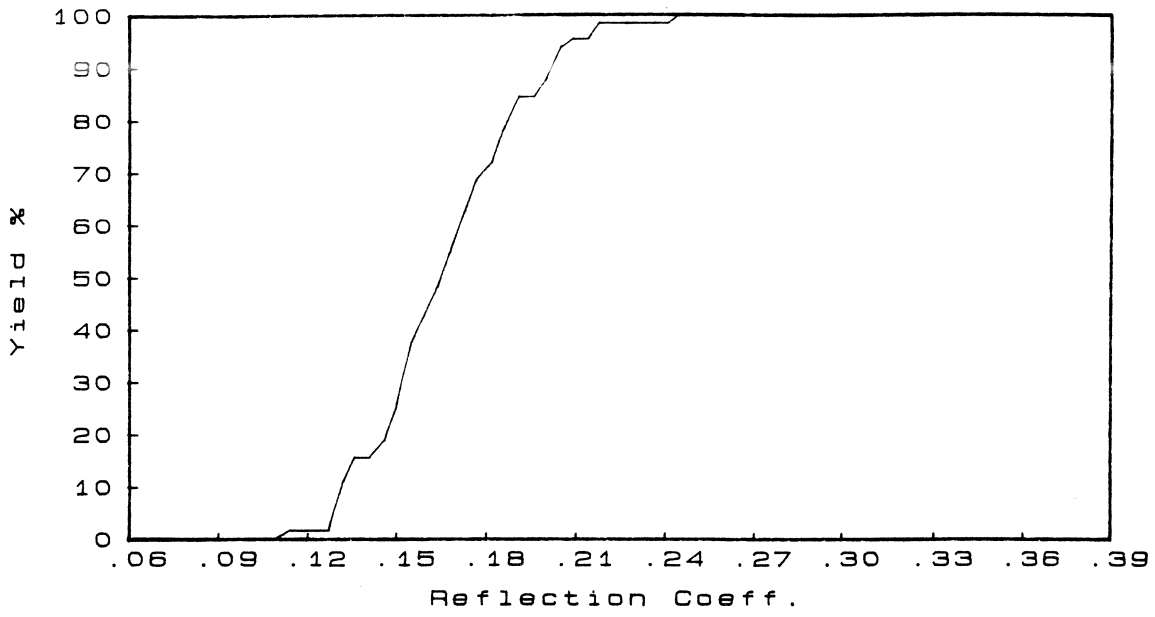
FILE: VAOAF21
RANGES OF REFLECTION COEFFICIENTS : .1192 .2450

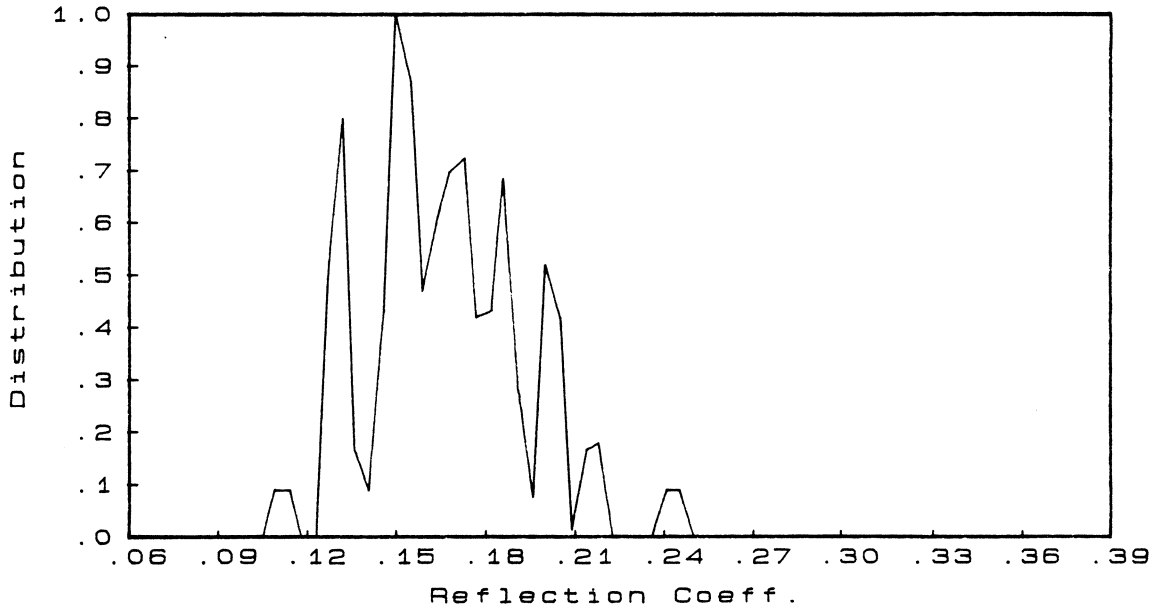
Fig. 4 Vertex analysis of the solution to the FTP obtained using all vertices of the tolerance region and 21 sample frequency points.



FILE: MCOAF7
RANGES OF REFLECTION COEFFICIENTS : .1141 .1786

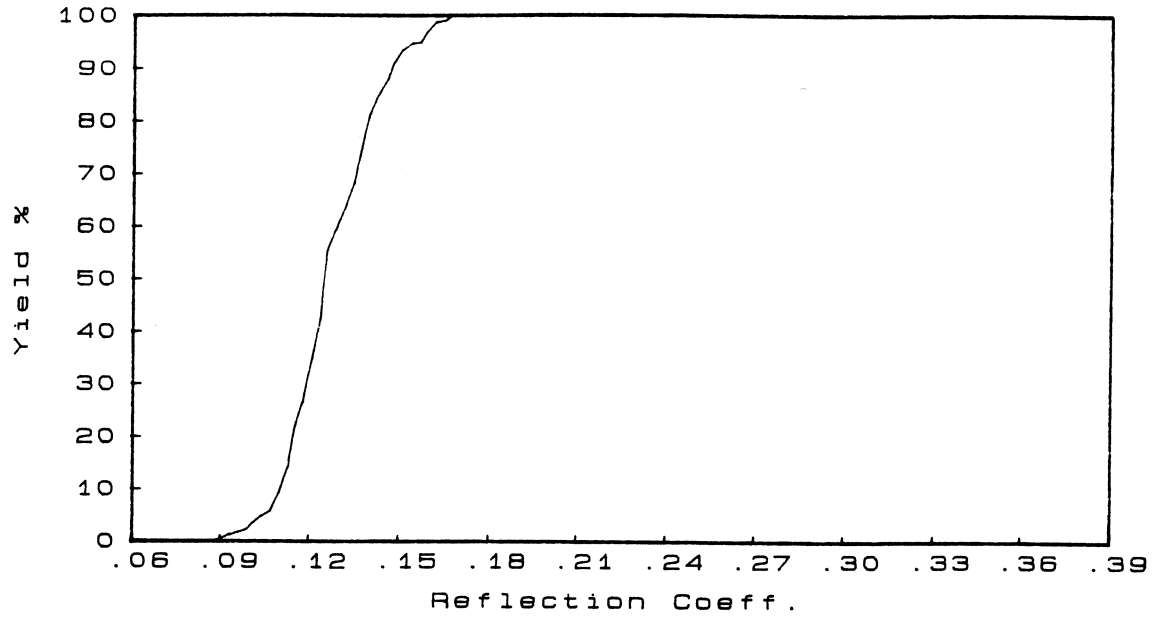
Fig. 5 Monte Carlo analysis of the solution to the FTP obtained using all vertices of the tolerance region and 7 sample frequency points.

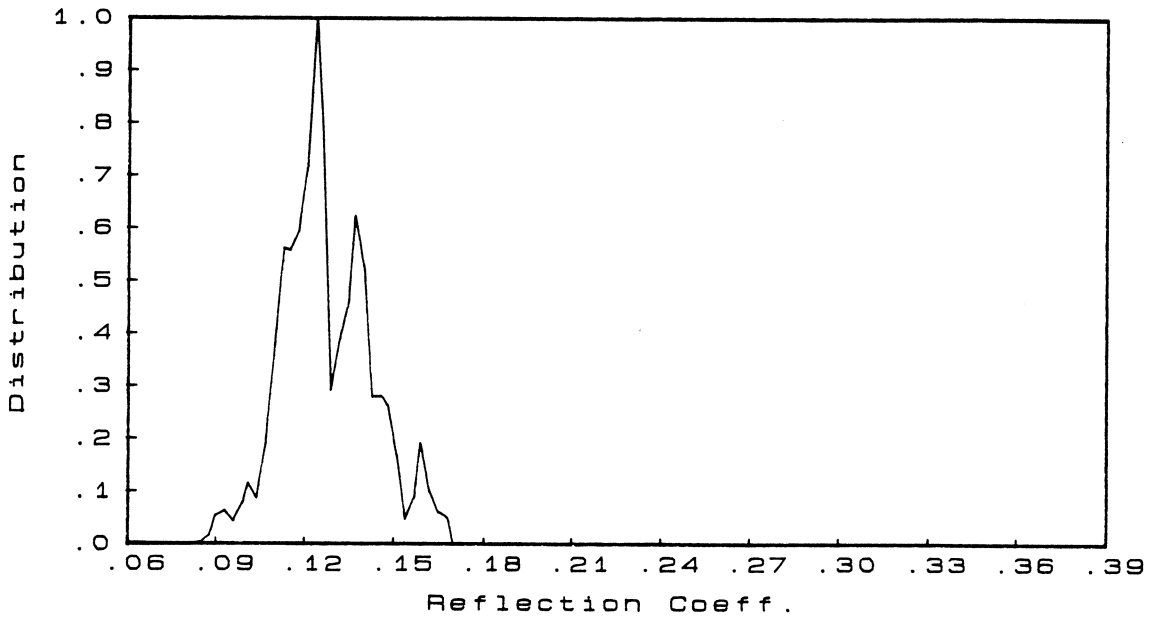




FILE: VAOAF7
RANGES OF REFLECTION COEFFICIENTS : .1137 .2455

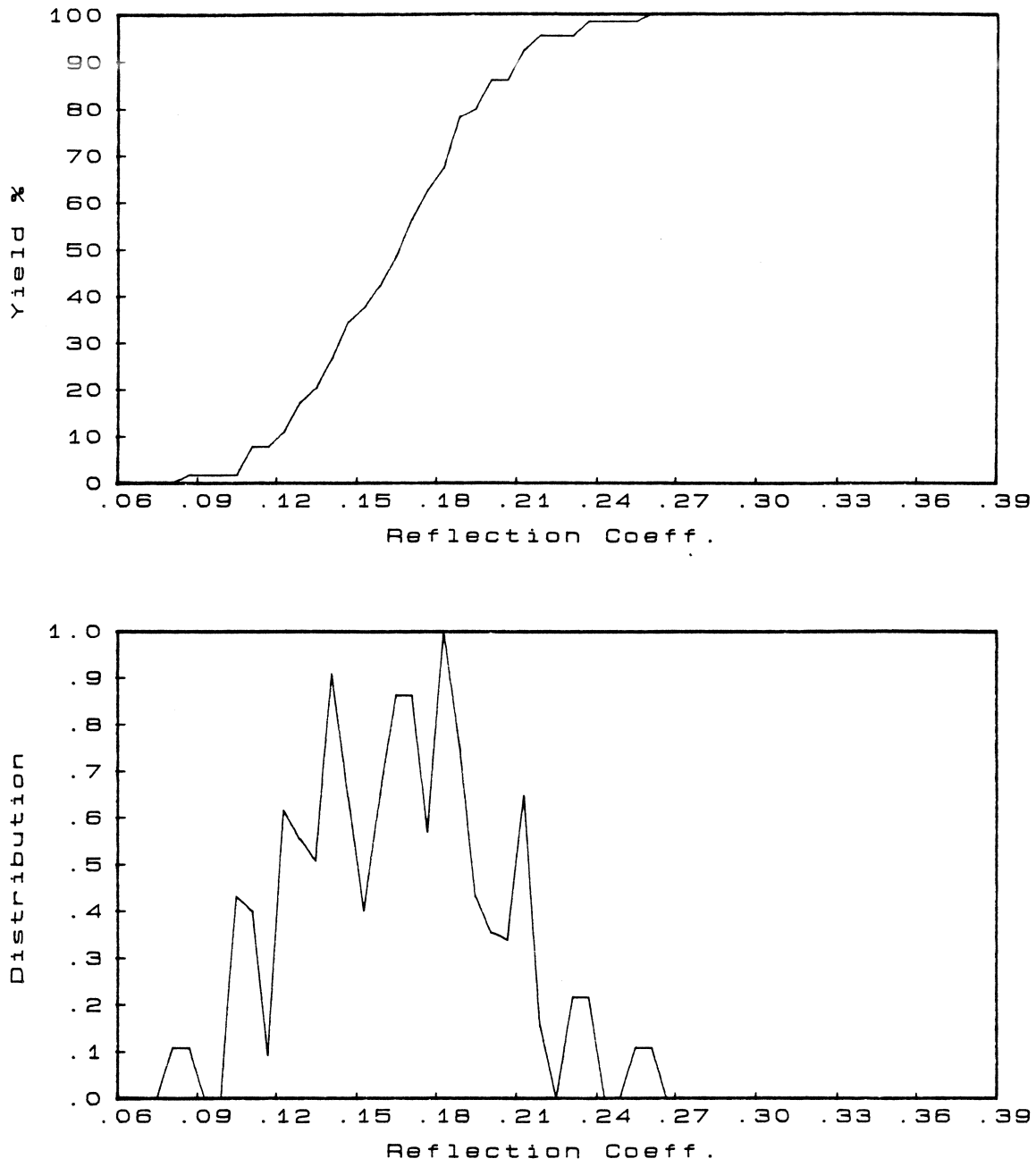
Fig. 6 Vertex analysis of the solution to the FTP obtained using all vertices of the tolerance region and 7 sample frequency points.





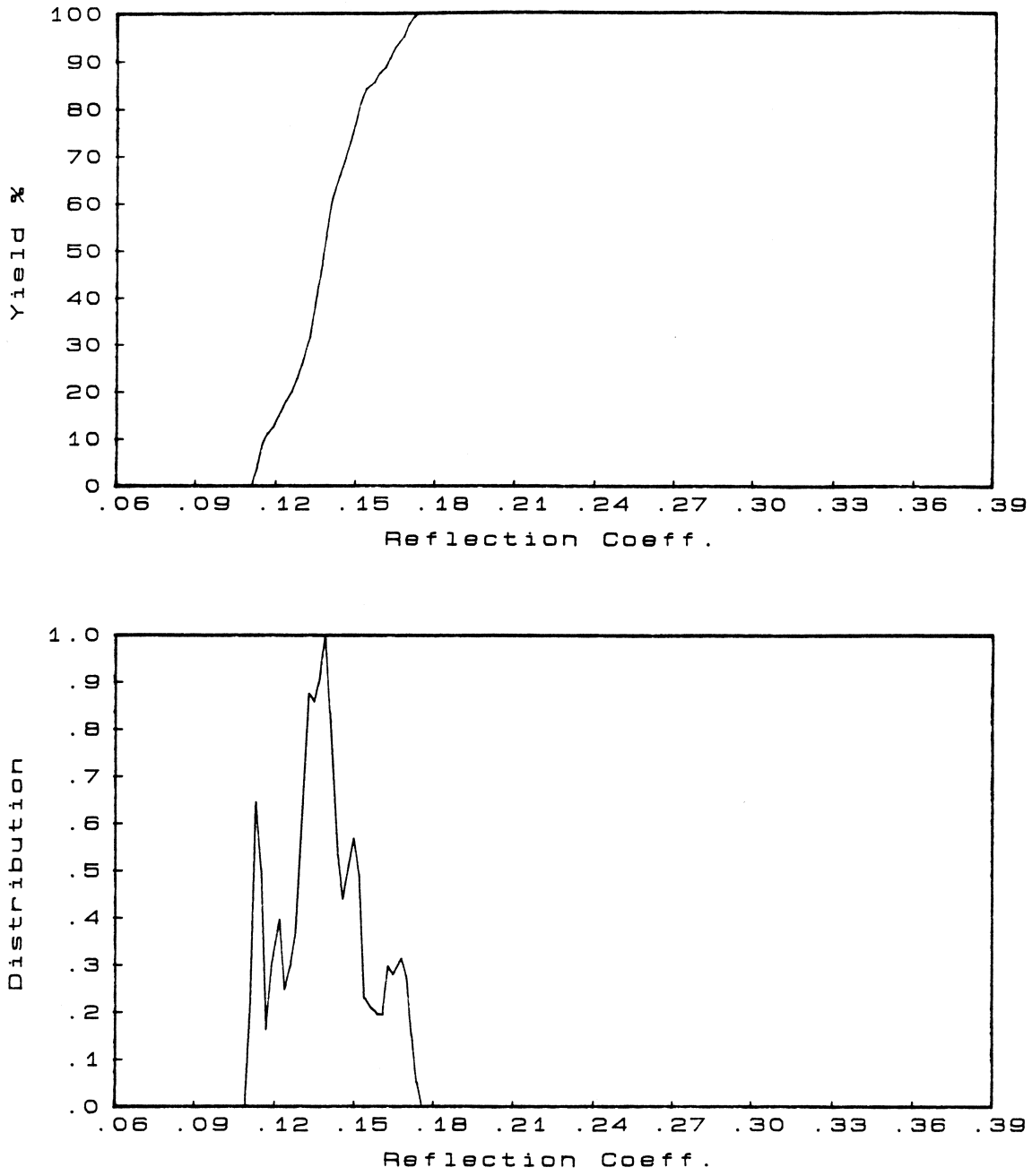
FILE: MCOAF4
RANGES OF REFLECTION COEFFICIENTS : .0878 .1676

Fig. 7 Monte Carlo analysis of the solution to the FTP obtained using all vertices of the tolerance region and 4 sample frequency points.



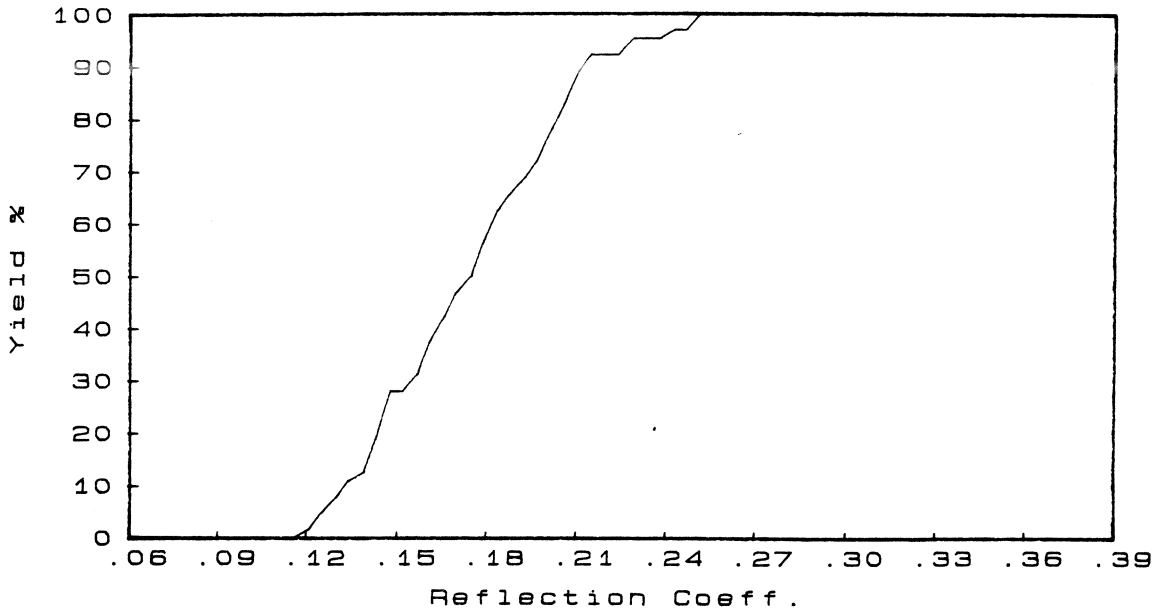
FILE: VAOAF4
RANGES OF REFLECTION COEFFICIENTS : .0874 .2613

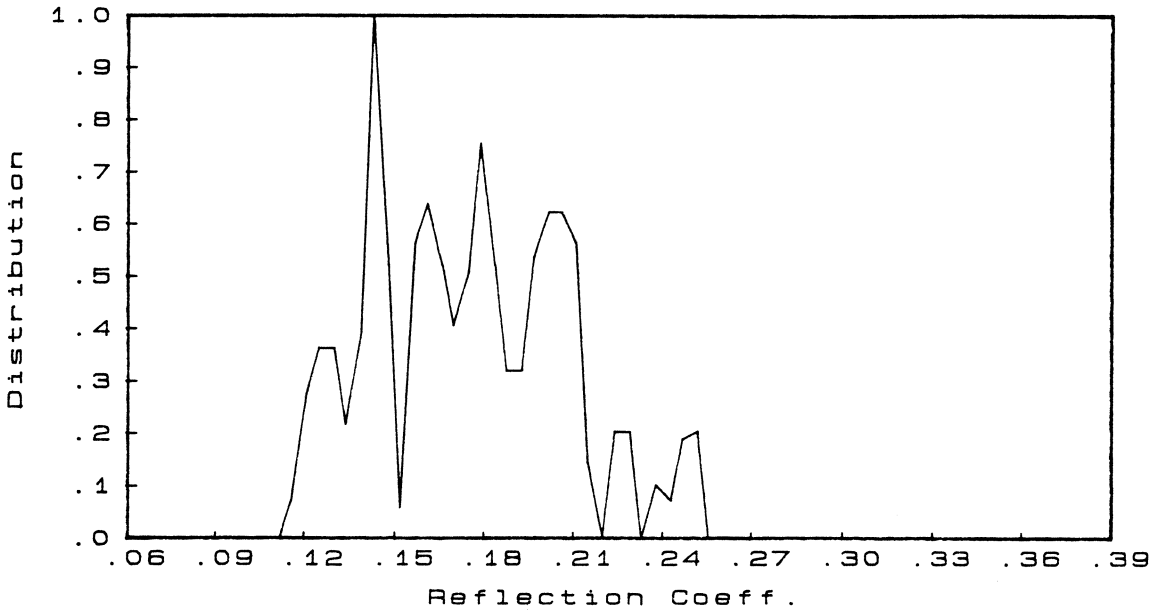
Fig. 8 Vertex analysis of the solution to the FTP obtained using all vertices of the tolerance region and 4 sample frequency points.



FILE: MCODF21
RANGES OF REFLECTION COEFFICIENTS : .1108 .1741

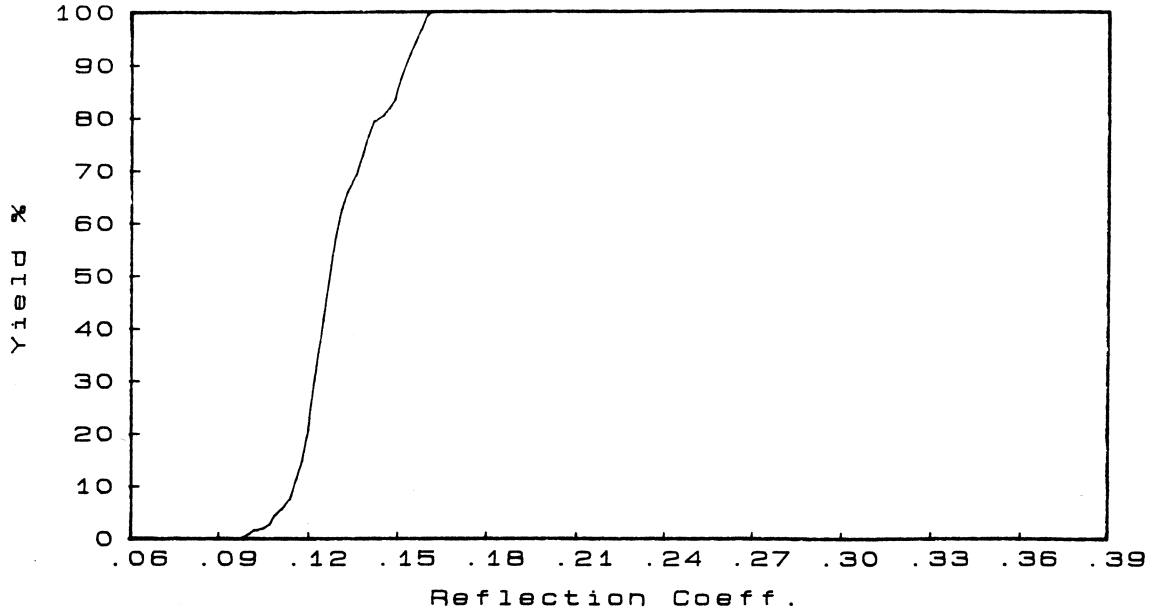
Fig. 9 Monte Carlo analysis of the solution to the FTP obtained using all vertices of the tolerance region plus the weighted nominal point and 21 sample frequency points.

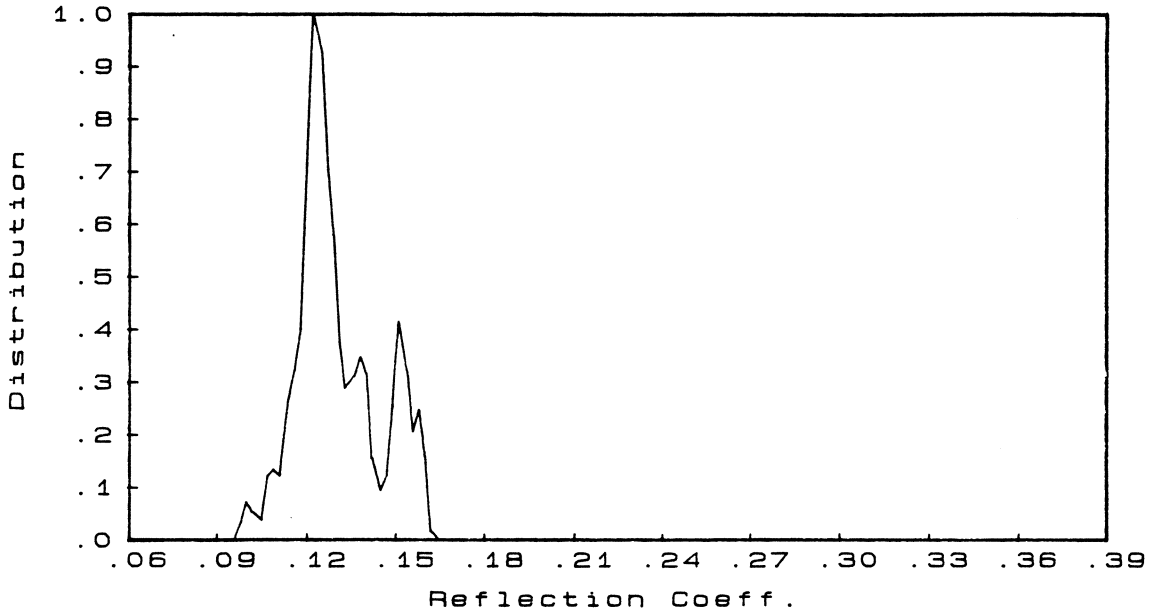




FILE: VAODF21
RANGES OF REFLECTION COEFFICIENTS : .1205 .2515

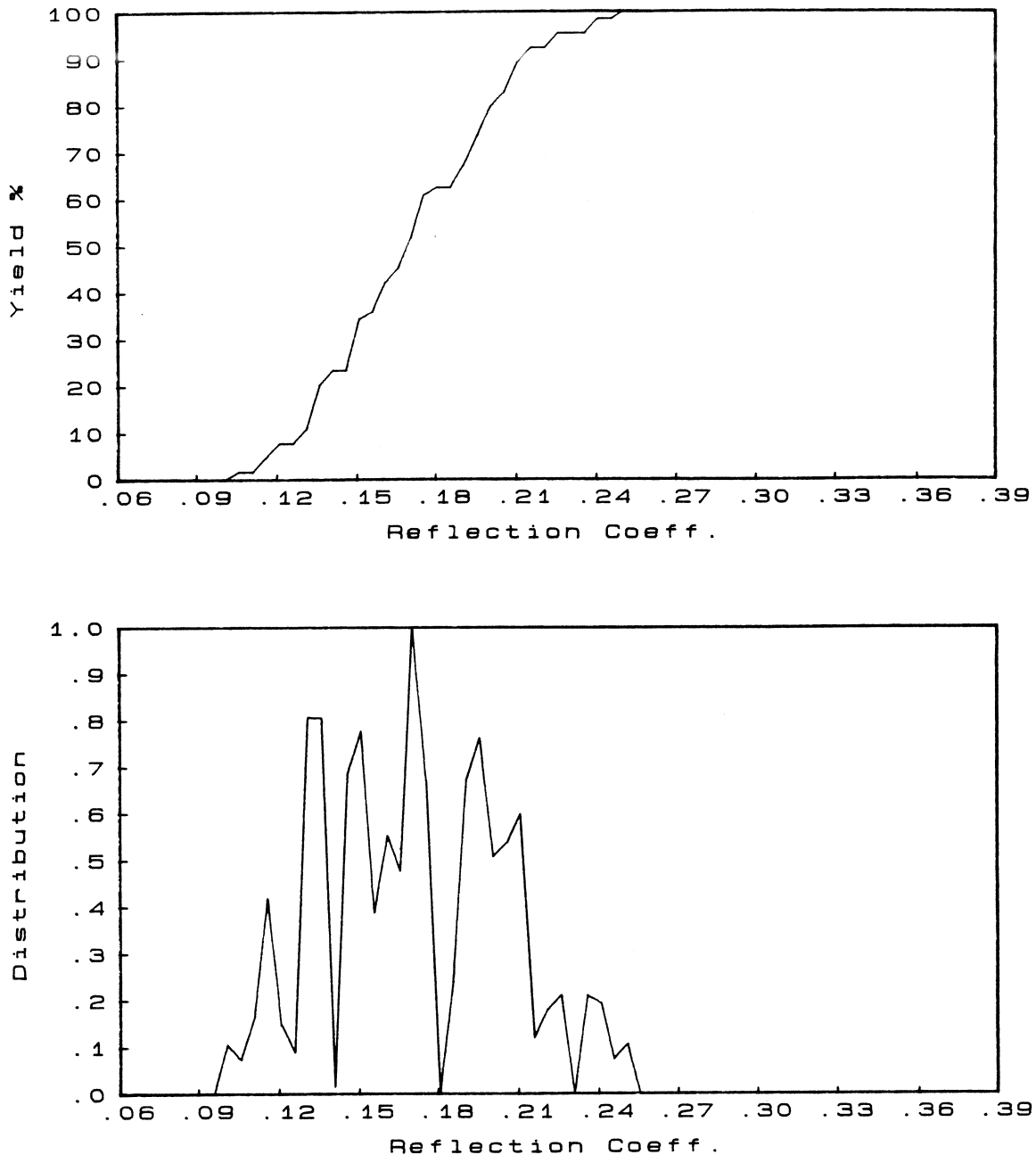
Fig. 10 Vertex analysis of the solution to the FTP obtained using all vertices of the tolerance region plus the weighted nominal point and 21 sample frequency points.





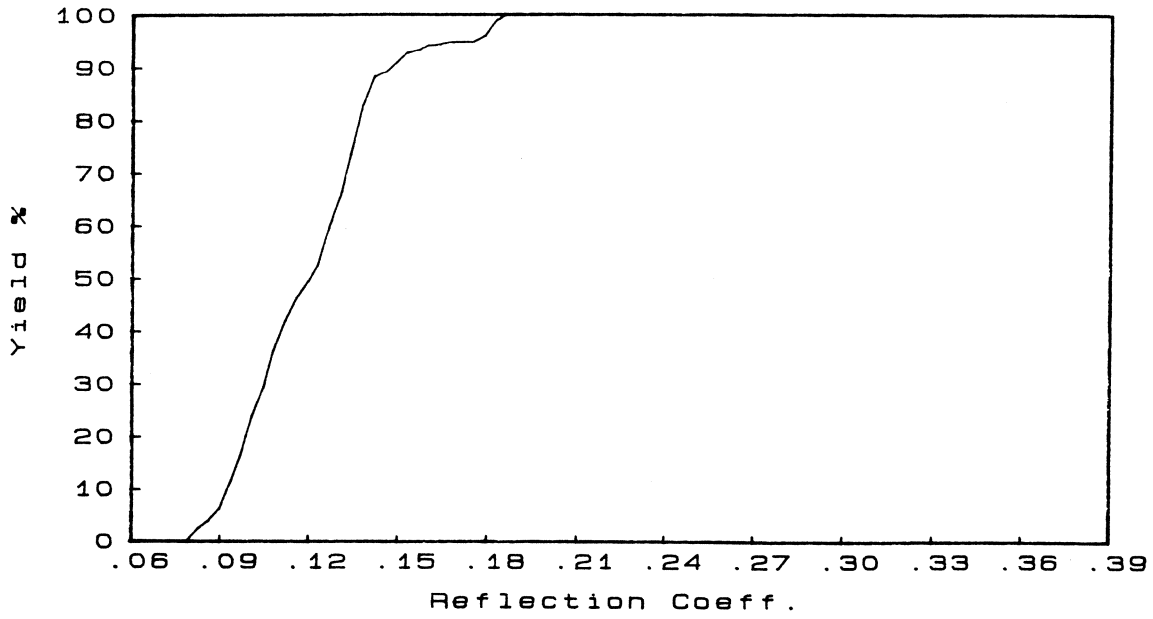
FILE: MCODF7
RANGES OF REFLECTION COEFFICIENTS : .0979 .1624

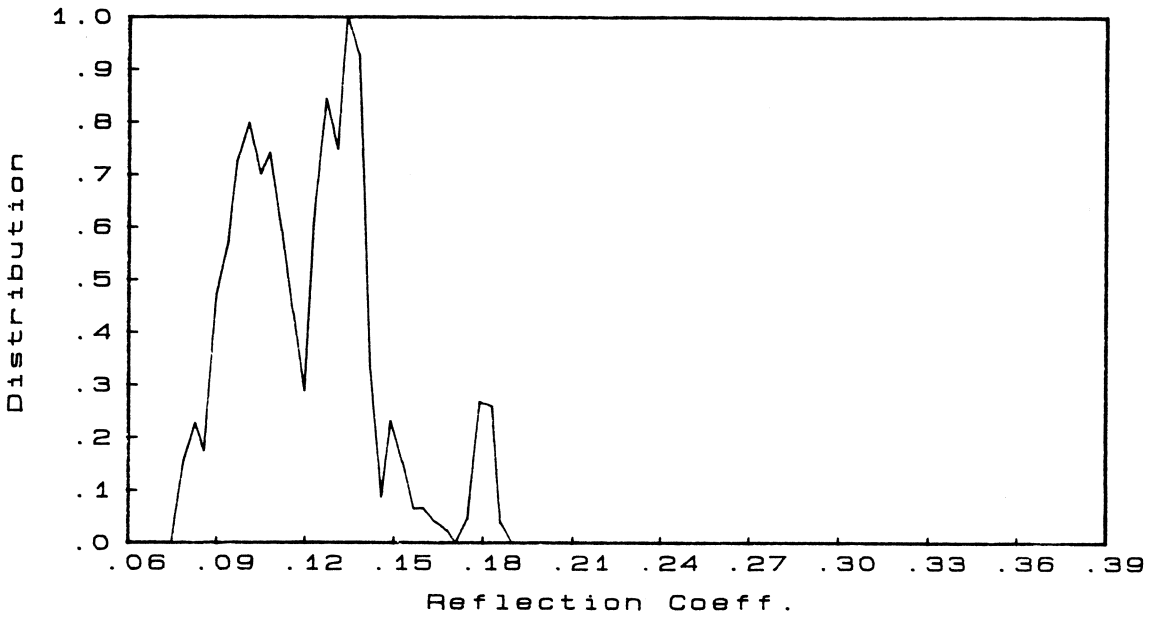
Fig. 11 Monte Carlo analysis of the solution to the FTP obtained using all vertices of the tolerance region plus the weighted nominal point and 7 sample frequency points.



FILE: VAODF7
RANGES OF REFLECTION COEFFICIENTS : .1062 .2513

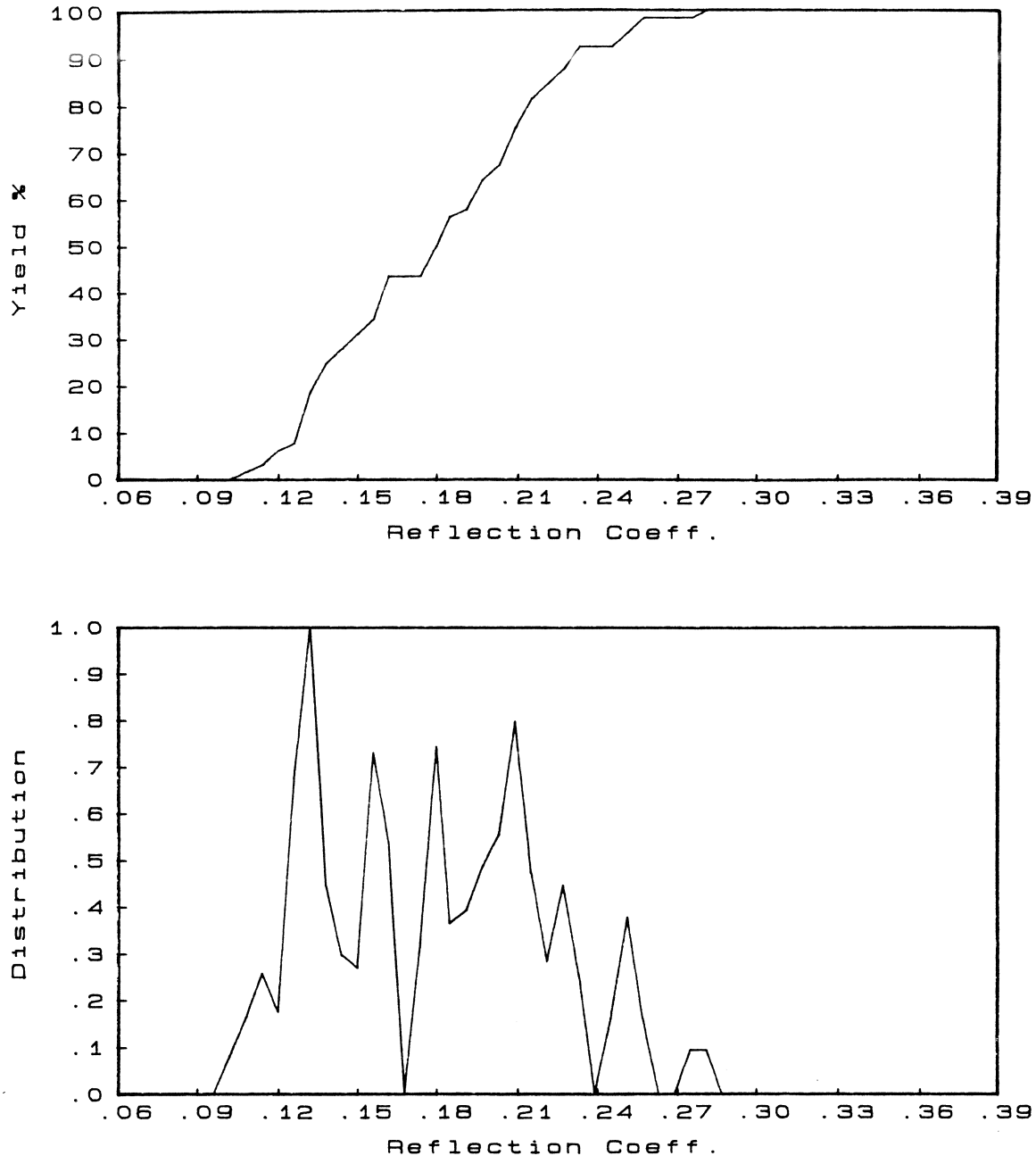
Fig. 12 Vertex analysis of the solution to the FTP obtained using all vertices of the tolerance region plus the weighted nominal point and 7 sample frequency points.





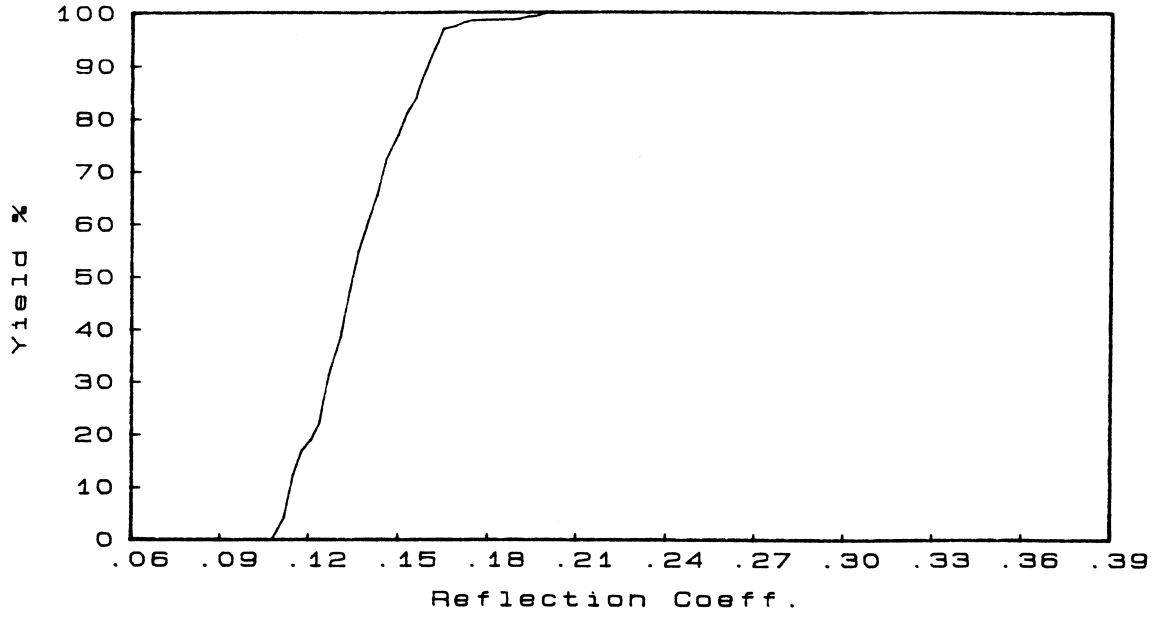
FILE: MCODF4
RANGES OF REFLECTION COEFFICIENTS : .0788 .1862

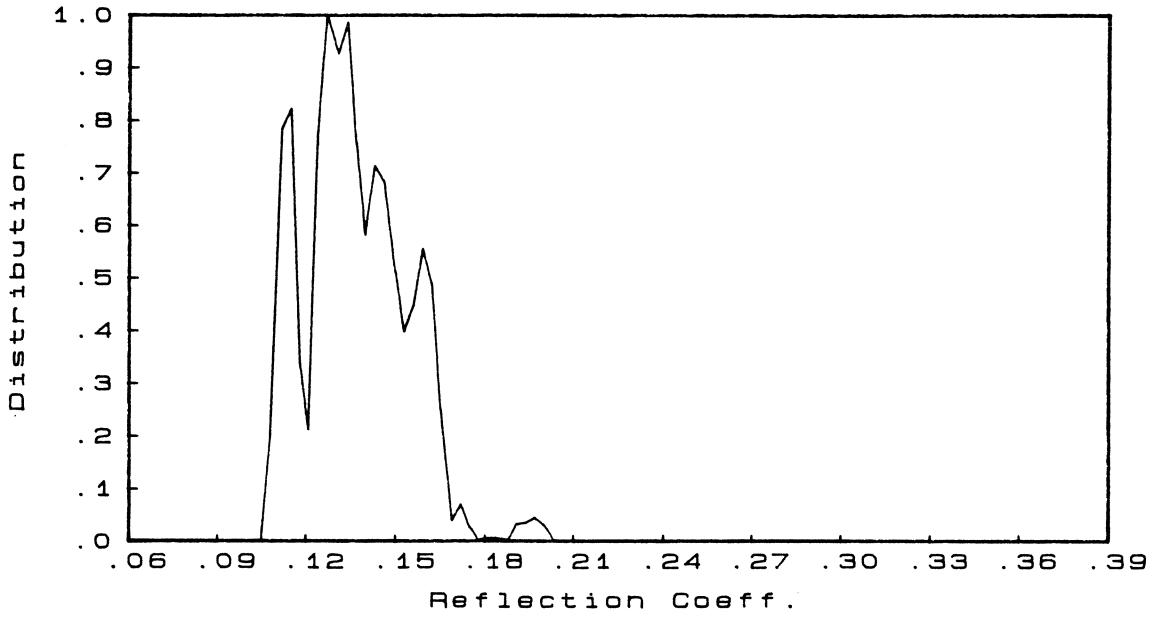
Fig. 13 Monte Carlo analysis of the solution to the FTP obtained using all vertices of the tolerance region plus the weighted nominal point and 4 sample frequency points.



FILE: VAODF4
RANGES OF REFLECTION COEFFICIENTS : .1079 .2810

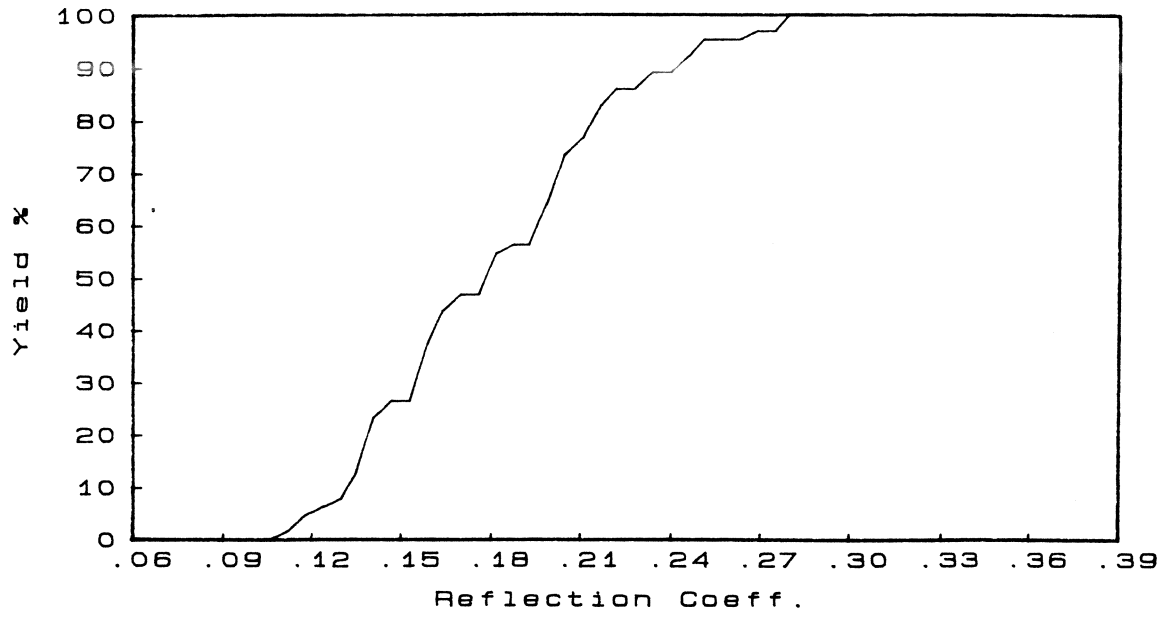
Fig. 14 Vertex analysis of the solution to the FTP obtained using all vertices of the tolerance region plus the weighted nominal point and 4 sample frequency points.

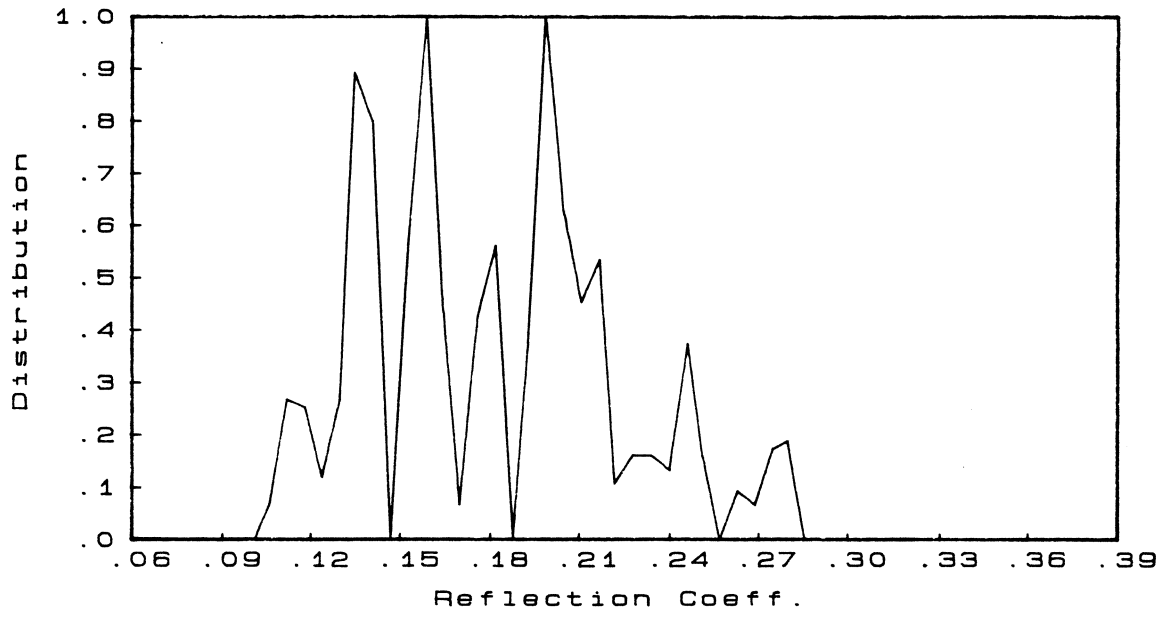




FILE: MCOEF21
RANGES OF REFLECTION COEFFICIENTS : .1083 .2004

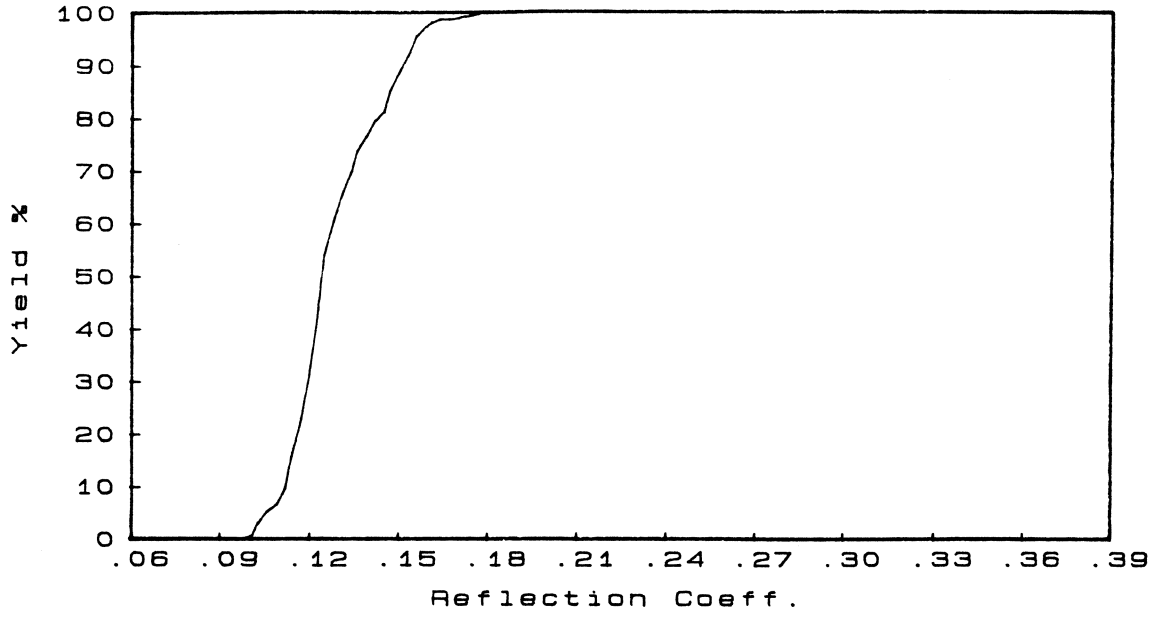
Fig. 15 Monte Carlo analysis of the solution to the FTP obtained using Monte Carlo design with 50 random outcomes and 21 sample frequency points.

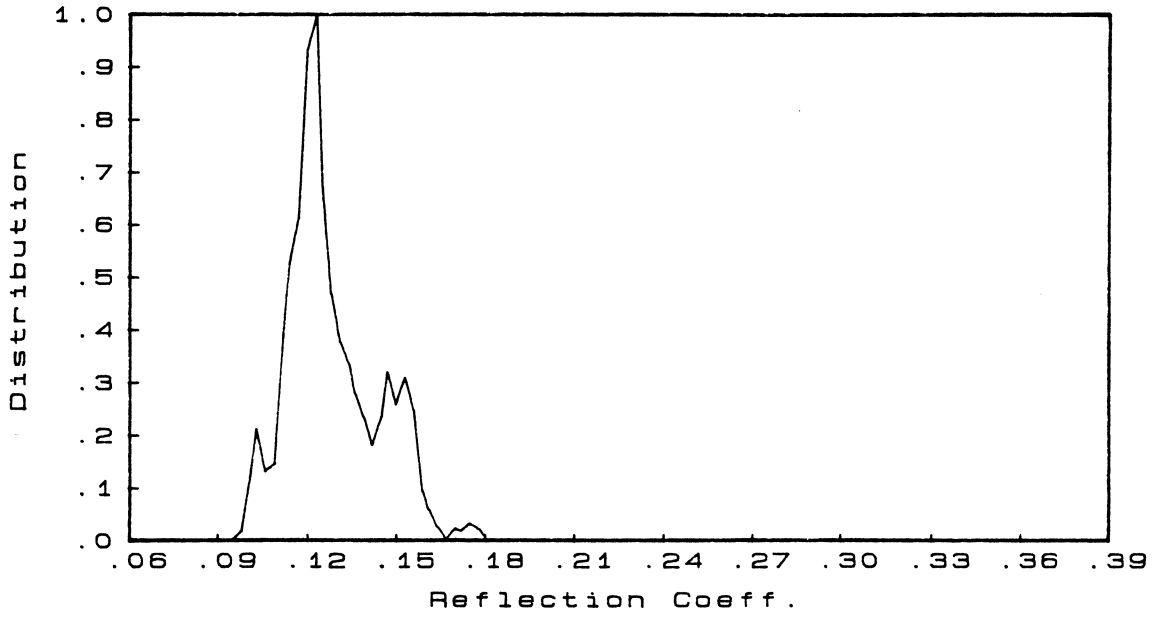




FILE: VAOEF21
RANGES OF REFLECTION COEFFICIENTS : .1122 .2804

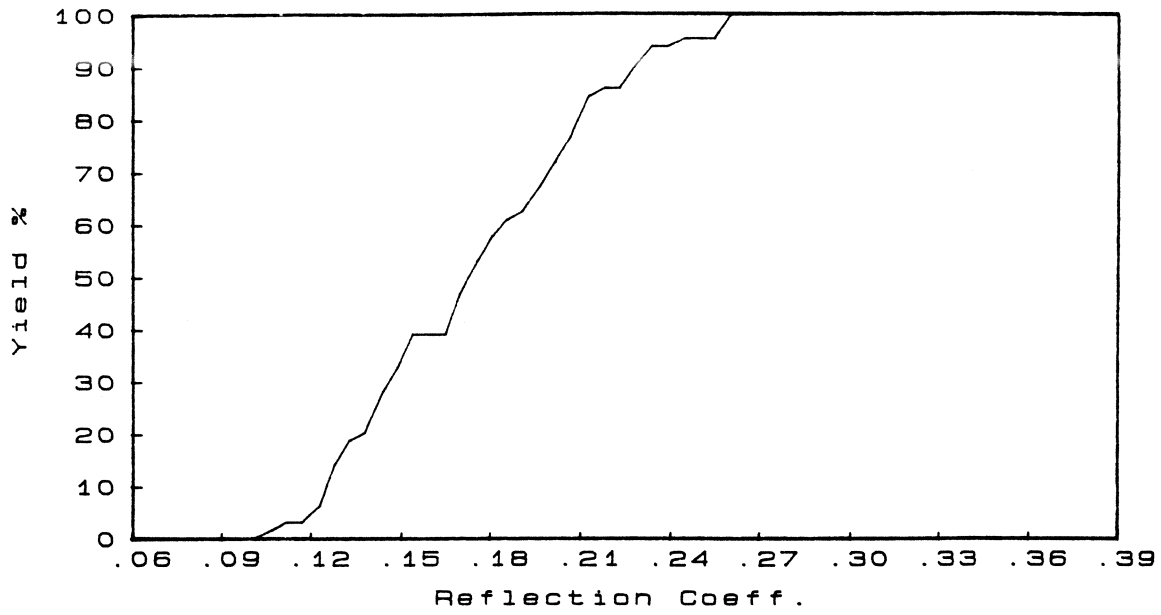
Fig. 16 Vertex analysis of the solution to the FTP obtained using Monte Carlo design with 50 random outcomes and 21 sample frequency points.

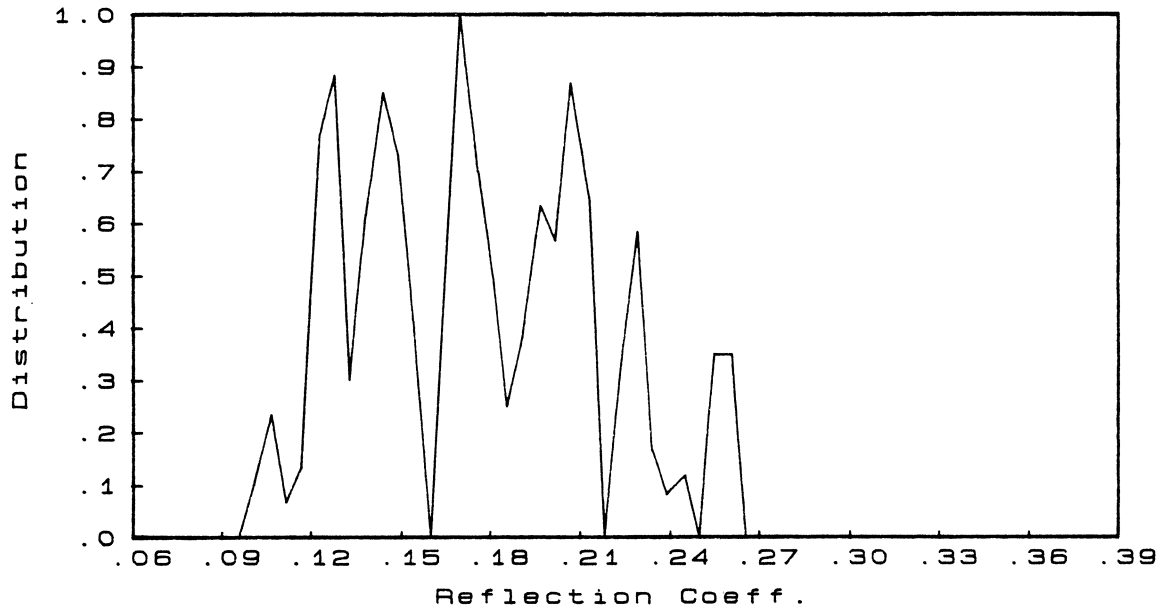




FILE: MCOEF7
RANGES OF REFLECTION COEFFICIENTS : .0977 .1779

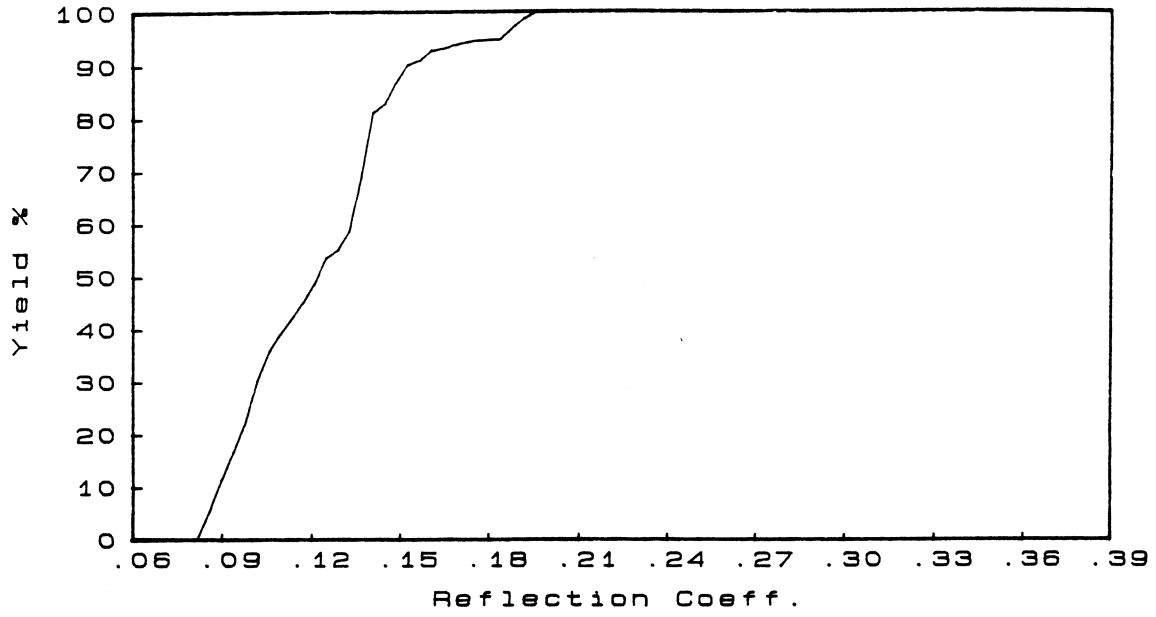
Fig. 17 Monte Carlo analysis of the solution to the FTP obtained using Monte Carlo design with 50 random outcomes and 7 sample frequency points.

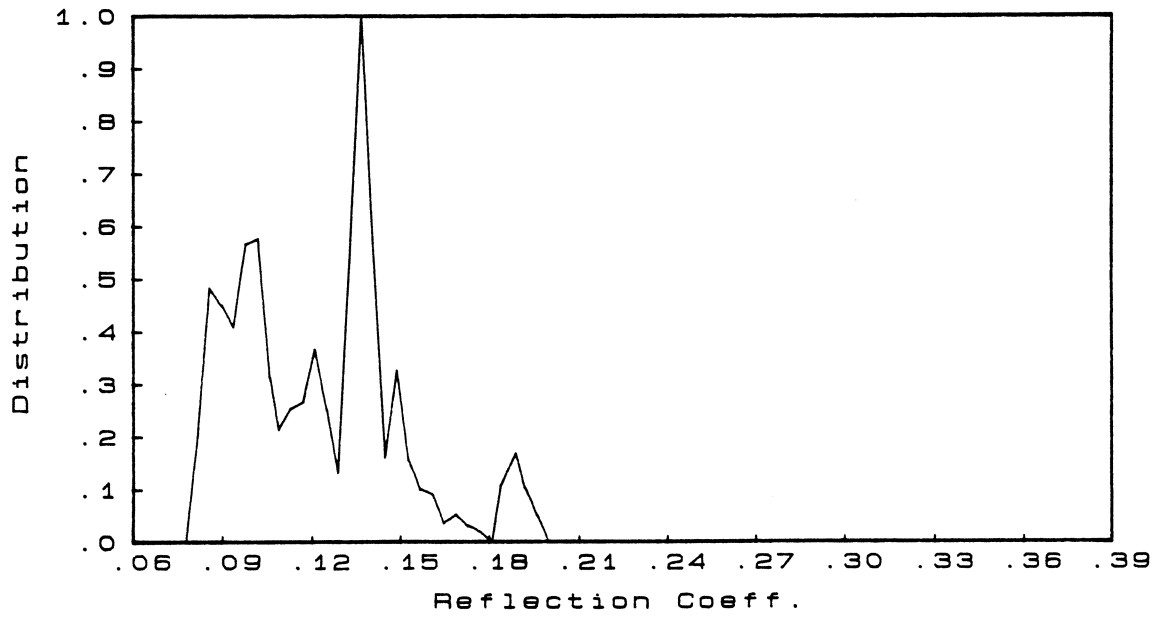




FILE: VAOEF7
RANGES OF REFLECTION COEFFICIENTS : .1066 .2605

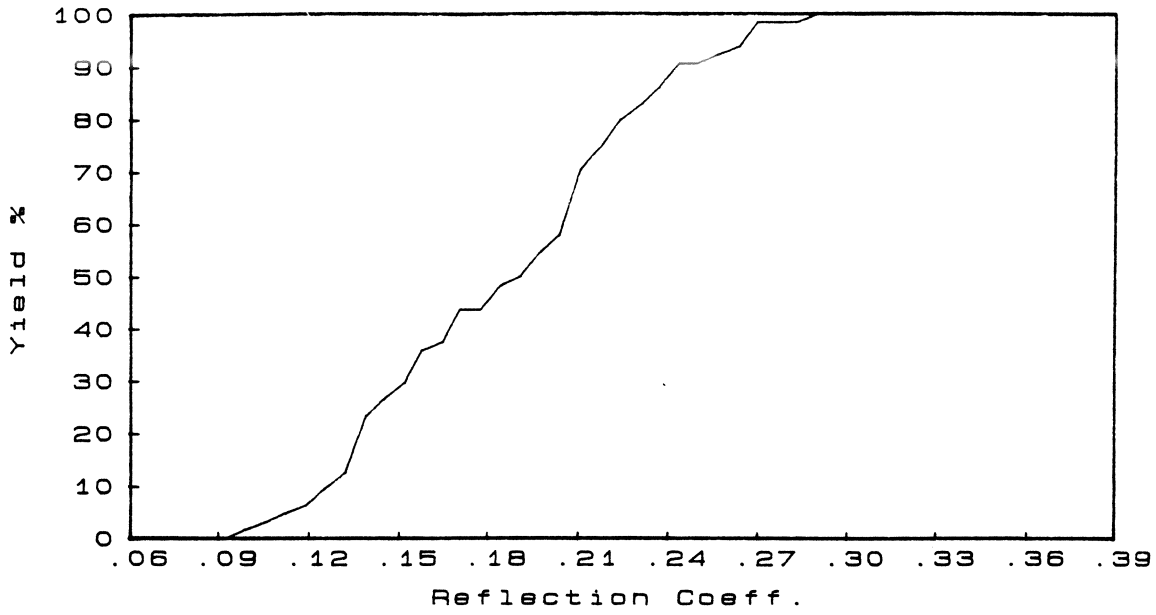
Fig. 18 Vertex analysis of the solution to the FTP obtained using Monte Carlo design with 50 random outcomes and 7 sample frequency points.

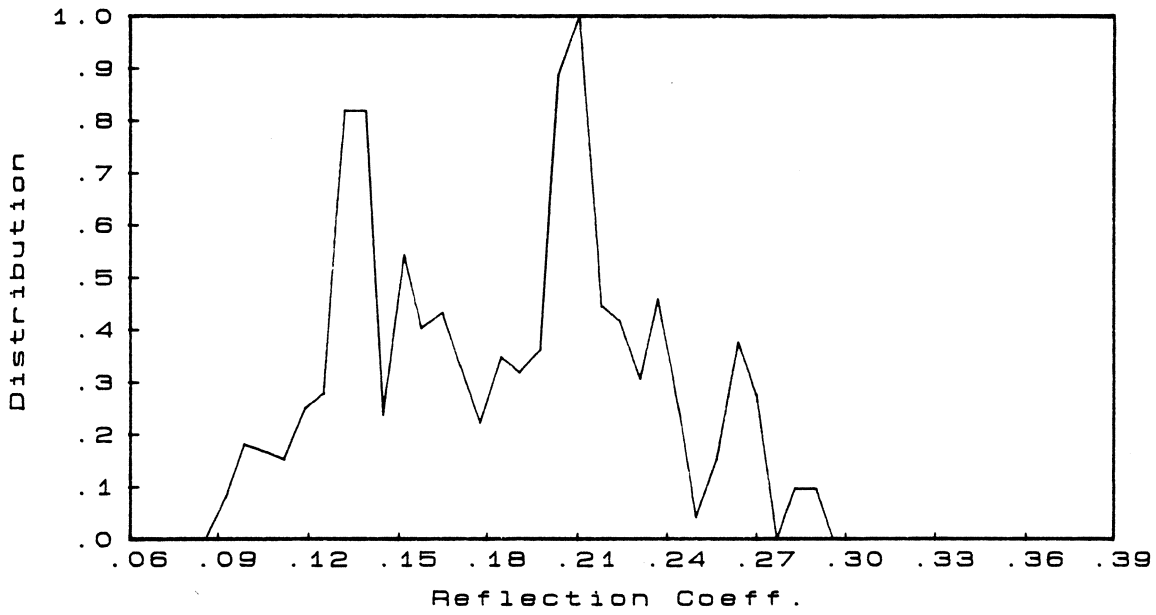




FILE: MCOEF4
RANGES OF REFLECTION COEFFICIENTS : .0818 .1964

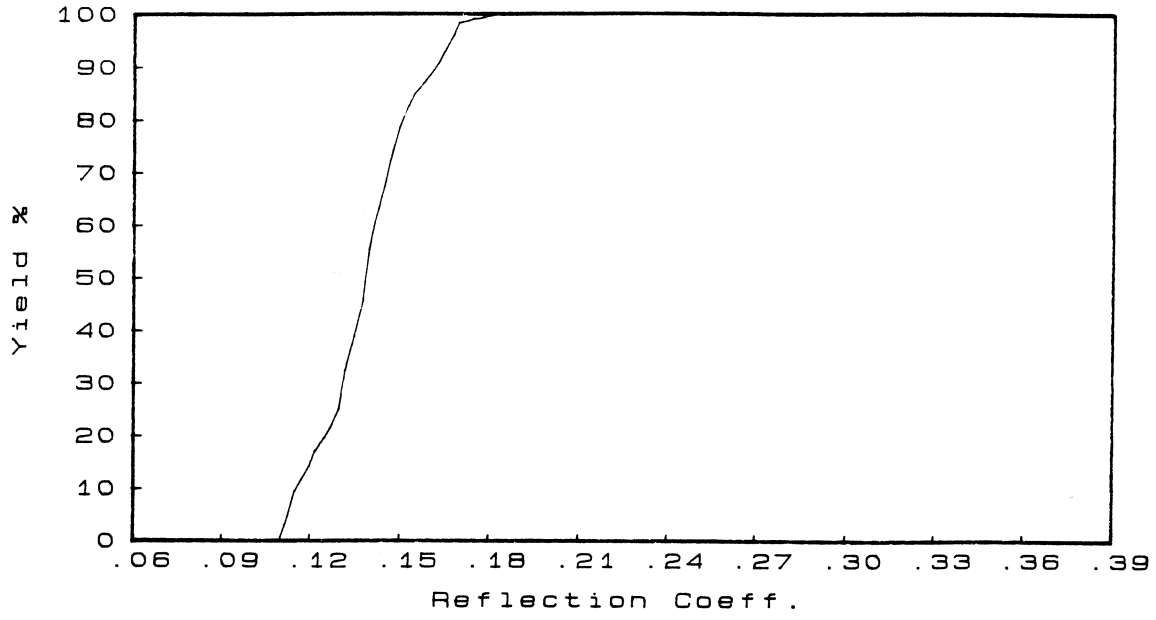
Fig. 19 Monte Carlo analysis of the solution to the FTP obtained using Monte Carlo design with 50 random outcomes and 4 sample frequency points.

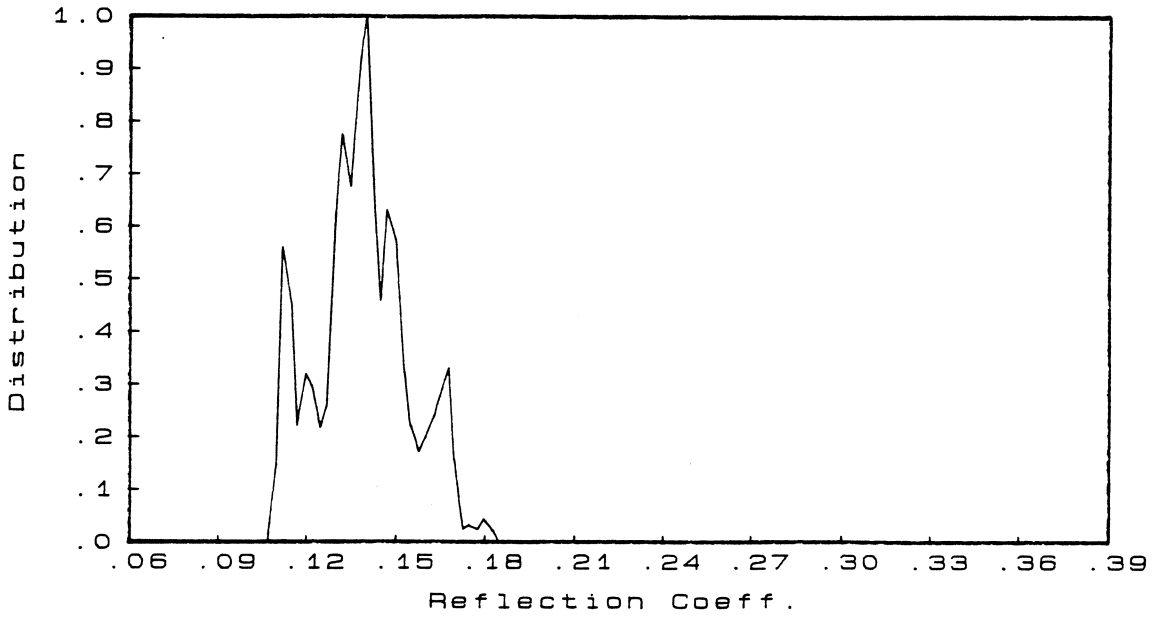




FILE: VAOEF4
RANGES OF REFLECTION COEFFICIENTS : .0992 .2899

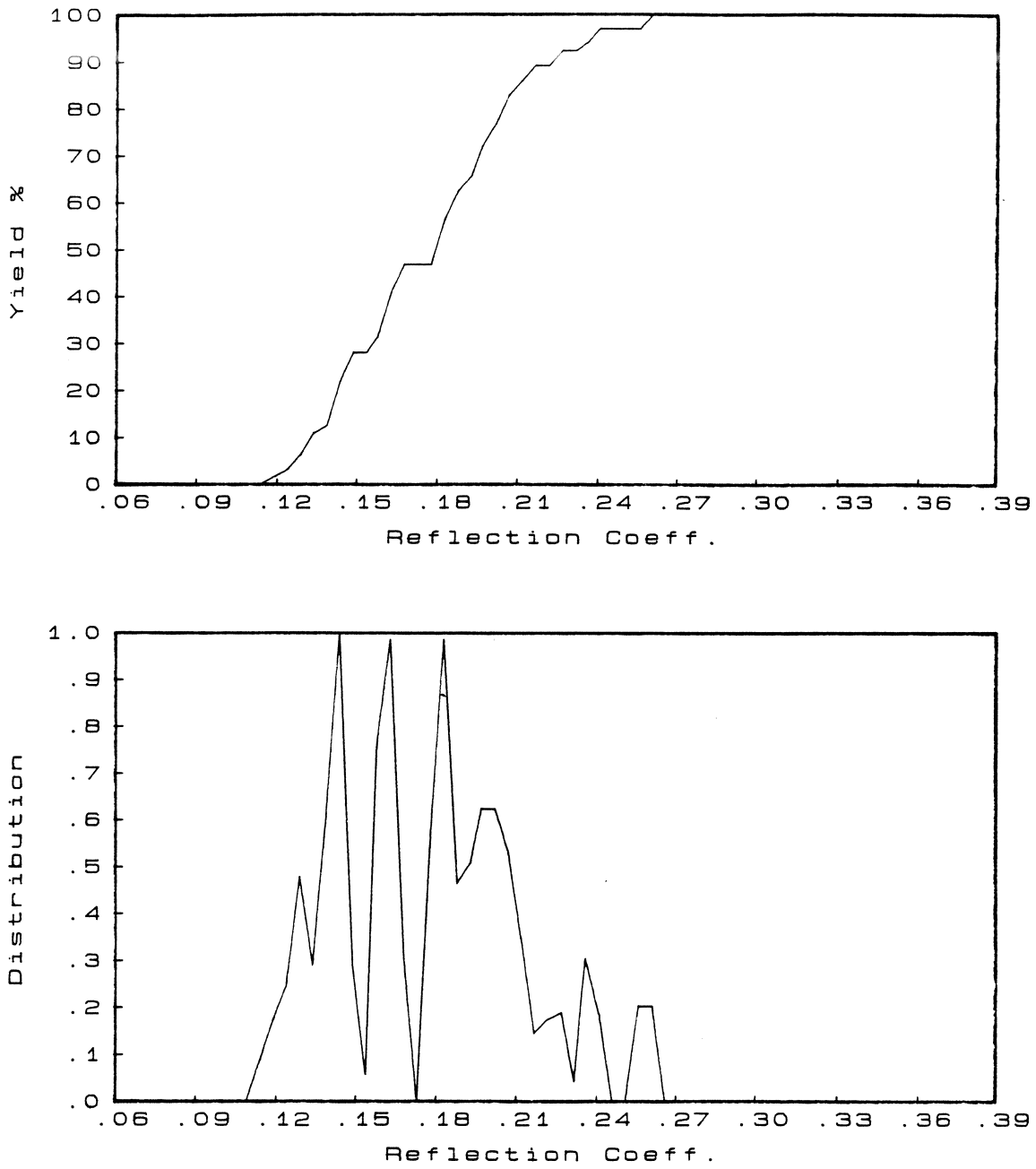
Fig. 20 Vertex analysis of the solution to the FTP obtained using Monte Carlo design with 50 random outcomes and 4 sample frequency points.





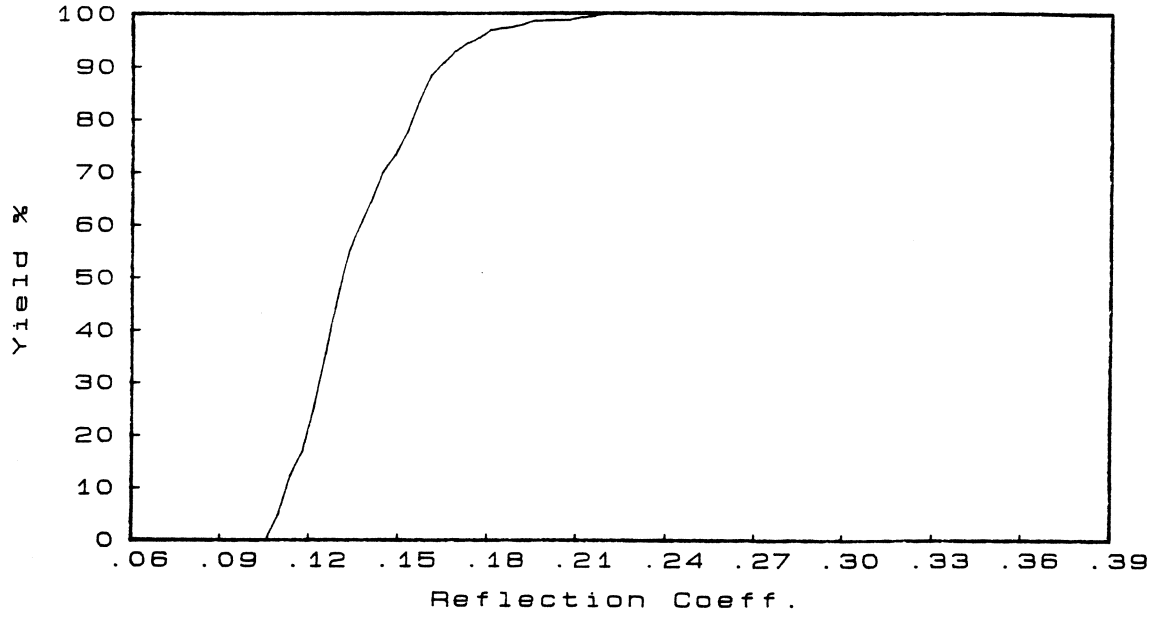
FILE: MCOASTP
RANGES OF REFLECTION COEFFICIENTS : .1098 .1827

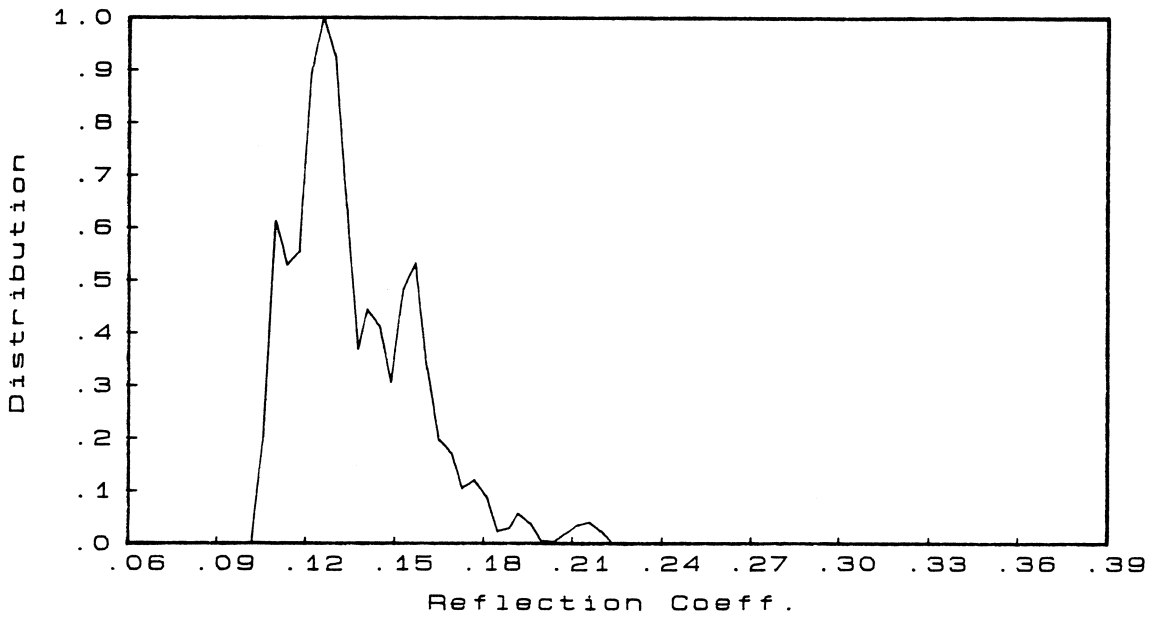
Fig. 21 Monte Carlo analysis of the result obtained after three stages of 5 iterations with problem re-starts when performing a FTP design with the quadratic approximation option. All vertices of the tolerance region and 21 sample frequency points were considered.



FILE: VAOASTP
RANGES OF REFLECTION COEFFICIENTS : .1193 .2610

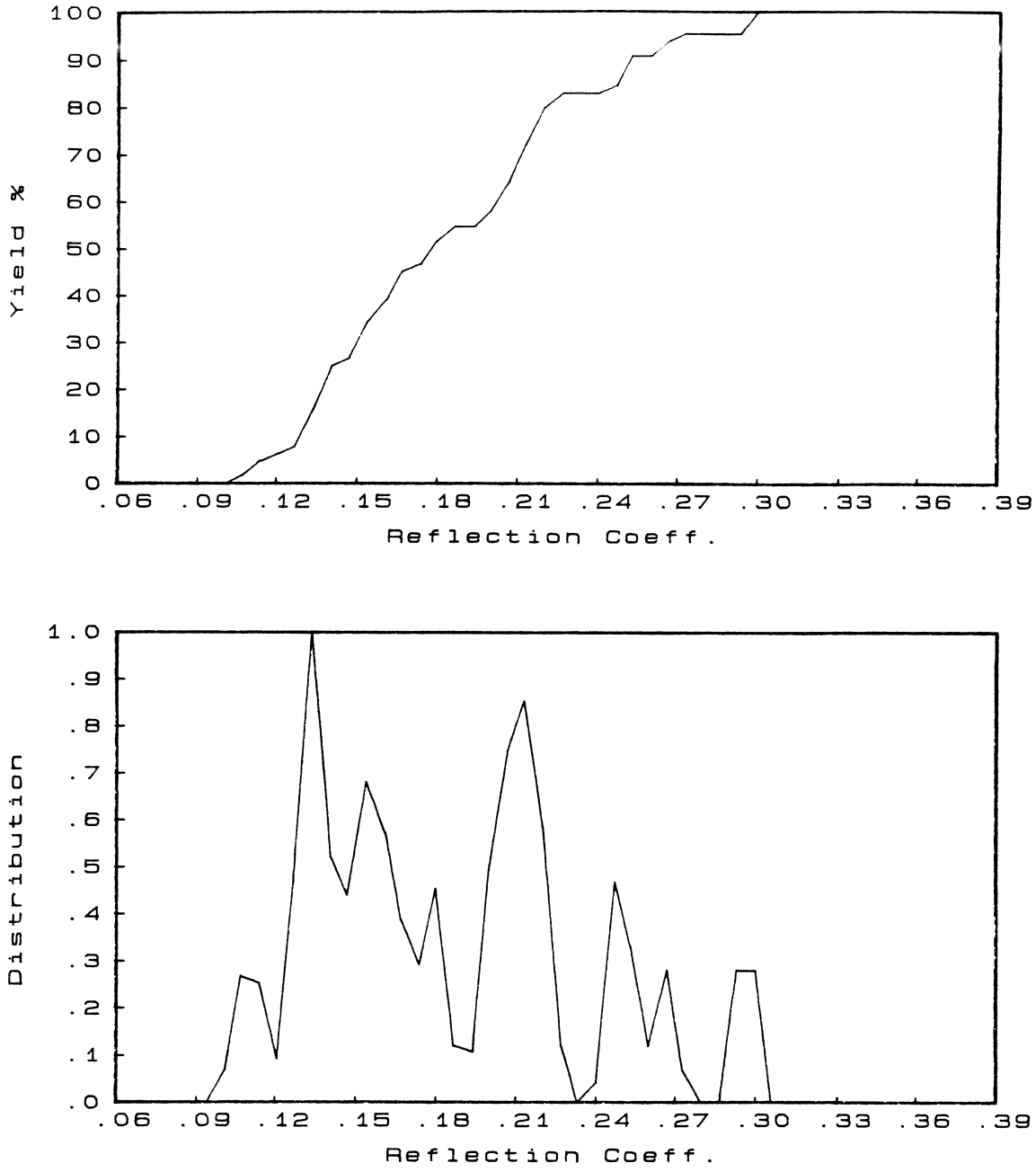
Fig. 22 Vertex analysis of the result obtained after three stages of 5 iterations with problem re-starts when performing a FTP design with the quadratic approximation option. All vertices of the tolerance region and 21 sample frequency points were considered.





FILE: MCOESTP
RANGES OF REFLECTION COEFFICIENTS : .1063 .2198

Fig. 23 Monte Carlo analysis of the result obtained after three stages of 5 iterations with problem re-starts when performing a FTP Monte Carlo design with the quadratic approximation option. Fifty random outcomes and 21 sample frequency points were considered.



FILE: VAOESTP
RANGES OF REFLECTION COEFFICIENTS : .1074 .2997

Fig. 24 Vertex analysis of the result obtained after three stages of 5 iterations with problem re-starts when performing a FTP Monte Carlo design with the quadratic approximation option. Fifty random outcomes and 21 sample frequency points were considered.

FILE: MCNOM
DATA: .32285 2.89640 .76090 2.28120 .96591 .96759
NUMBER OF RANDOM OUTCOMES : 1000

RANGES OF REFLECTION COEFFICIENTS : .1010 .2369

THRESHOLD	YIELD %	PROB. DENSITY
.0869	.0000	.0000
.0916	.0000	.0000
.0963	.0000	.0000
.1010	.1000	.0397
.1057	1.3000	.1095
.1103	4.2000	.5621
.1150	15.7000	.9379
.1197	27.5000	1.0000
.1244	41.2000	.9776
.1291	52.0000	.6914
.1338	59.0000	.3572
.1385	61.9000	.1645
.1432	64.6000	.3489
.1478	71.1000	.5538
.1525	78.1000	.5019
.1572	83.4000	.2305
.1619	84.6000	.1229
.1666	87.1000	.1581
.1713	88.5000	.1012
.1760	89.9000	.0980
.1807	91.2000	.1408
.1853	93.4000	.1268
.1900	94.5000	.1236
.1947	96.5000	.0883
.1994	96.7000	.0141
.2041	97.2000	.0512
.2088	97.9000	.0346
.2135	98.1000	.0211
.2182	98.5000	.0224
.2228	98.7000	.0269
.2275	99.2000	.0314
.2322	99.5000	.0327
.2369	100.0000	.0205
.2416	100.0000	.0000
.2463	100.0000	.0000
.2510	100.0000	.0000
.2557	100.0000	.0000

FILE: VANOM
DATA: .32285 2.89640 .76090 2.28120 .96591 .96759
NUMBER OF VERTICES : 64

RANGES OF REFLECTION COEFFICIENTS : .1078 .3178

THRESHOLD	YIELD %	PROB. DENSITY
.0861	.0000	.0000
.0934	.0000	.0000
.1006	.0000	.0606
.1078	1.5625	.4242
.1151	6.2500	.2121
.1223	6.2500	.5606
.1296	15.6250	.7727
.1368	18.7500	.5758
.1440	26.5625	1.0000
.1513	34.3750	.6364
.1585	37.5000	.2424
.1658	40.6250	.9242
.1730	51.5625	.6818
.1803	51.5625	.0909
.1875	54.6875	.3182
.1947	56.2500	.0152
.2020	56.2500	.3788
.2092	62.5000	.5455
.2165	65.6250	.7424
.2237	75.0000	.8939
.2309	79.6875	.4394
.2382	82.8125	.1515
.2454	82.8125	.0758
.2527	84.3750	.0758
.2599	84.3750	.1515
.2672	87.5000	.5303
.2744	92.1875	.2576
.2816	92.1875	.1667
.2889	95.3125	.2121
.2961	95.3125	.0000
.3034	95.3125	.0000
.3106	95.3125	.3182
.3178	100.0000	.3182
.3251	100.0000	.0000
.3323	100.0000	.0000
.3396	100.0000	.0000

FILE: MCOAF21
DATA: .30052 2.67090 .70563 2.11650 .89034 .90129
NUMBER OF RANDOM OUTCOMES : 1000

RANGES OF REFLECTION COEFFICIENTS : .1210 .1924

THRESHOLD	YIELD %	PROB. DENSITY
.1136	.0000	.0000
.1161	.0000	.0000
.1186	.0000	.0021
.1210	.1000	.0267
.1235	.6000	.1432
.1259	2.3000	.2393
.1284	4.2000	.2714
.1309	6.5000	.3045
.1333	8.8000	.2671
.1358	10.6000	.1912
.1382	12.0000	.2019
.1407	14.2000	.4370
.1432	18.7000	.6218
.1456	23.3000	.5128
.1481	26.6000	.3483
.1505	29.4000	.4957
.1530	34.9000	.9359
.1555	43.3000	1.0000
.1579	50.2000	.9498
.1604	58.2000	.9936
.1628	65.2000	.7799
.1653	70.3000	.5331
.1678	74.0000	.5235
.1702	78.7000	.6325
.1727	83.4000	.5032
.1751	86.3000	.2521
.1776	87.7000	.1859
.1801	89.5000	.2415
.1825	91.6000	.3590
.1850	94.9000	.3803
.1874	97.3000	.3034
.1899	99.5000	.1763
.1924	100.0000	.0139
.1948	100.0000	.0000
.1973	100.0000	.0000
.1997	100.0000	.0000

FILE: VAOAF21
DATA: .30052 2.67090 .70563 2.11650 .89034 .90129
NUMBER OF VERTICES : 64

RANGES OF REFLECTION COEFFICIENTS : .1192 .2450

THRESHOLD	YIELD %	PROB. DENSITY
.1062	.0000	.0000
.1105	.0000	.0000
.1149	.0000	.0909
.1192	1.5625	.2121
.1235	3.1250	.0758
.1279	3.1250	.0303
.1322	4.6875	.5303
.1365	10.9375	.3333
.1409	10.9375	.4242
.1452	18.7500	.8030
.1496	23.4375	.5303
.1539	28.1250	.4545
.1582	31.2500	.2576
.1626	34.3750	1.0000
.1669	46.8750	.9545
.1712	50.0000	.5606
.1756	57.8125	.8333
.1799	64.0625	.9394
.1843	73.4375	.8788
.1886	78.1250	.2879
.1929	79.6875	.3182
.1973	84.3750	.6970
.2016	90.6250	.5606
.2059	93.7500	.3636
.2103	96.8750	.1667
.2146	96.8750	.0758
.2189	98.4375	.1061
.2233	98.4375	.0000
.2276	98.4375	.0000
.2320	98.4375	.0000
.2363	98.4375	.0000
.2406	98.4375	.1061
.2450	100.0000	.1061
.2493	100.0000	.0000
.2536	100.0000	.0000
.2580	100.0000	.0000
.2623	100.0000	.0000

FILE: MCOAF7
DATA: .30794 2.70020 .71735 2.15210 .90007 .92382
NUMBER OF RANDOM OUTCOMES : 1000

RANGES OF REFLECTION COEFFICIENTS : .1141 .1786

THRESHOLD	YIELD %	PROB. DENSITY
.1074	.0000	.0000
.1096	.0000	.0000
.1119	.0000	.0053
.1141	.1000	.0158
.1163	.3000	.0495
.1185	.9000	.0905
.1208	1.7000	.0842
.1230	2.7000	.2747
.1252	6.7000	.8116
.1274	14.8000	1.0000
.1297	21.4000	.6589
.1319	25.3000	.3895
.1341	28.1000	.3516
.1363	31.4000	.5358
.1386	36.8000	.8326
.1408	44.0000	.8242
.1430	49.8000	.8242
.1452	57.1000	.8789
.1475	63.3000	.7295
.1497	68.5000	.5116
.1519	71.7000	.4358
.1541	75.7000	.4937
.1564	79.5000	.5453
.1586	84.0000	.4495
.1608	86.3000	.1842
.1630	87.4000	.1695
.1653	89.2000	.2358
.1675	91.1000	.2758
.1697	93.5000	.2863
.1719	95.6000	.2905
.1742	98.0000	.2600
.1764	99.5000	.1221
.1786	100.0000	.0211
.1808	100.0000	.0000
.1830	100.0000	.0000
.1853	100.0000	.0000
.1875	100.0000	.0000

FILE: VAOAF7
DATA: .30794 2.70020 .71735 2.15210 .90007 .92382
NUMBER OF VERTICES : 64

RANGES OF REFLECTION COEFFICIENTS : .1137 .2455

THRESHOLD	YIELD %	PROB. DENSITY
.1001	.0000	.0000
.1047	.0000	.0000
.1092	.0000	.0886
.1137	1.5625	.0886
.1183	1.5625	.0000
.1228	1.5625	.0000
.1274	1.5625	.4937
.1319	10.9375	.7975
.1365	15.6250	.1646
.1410	15.6250	.0886
.1456	18.7500	.4304
.1501	25.0000	1.0000
.1547	37.5000	.8734
.1592	42.1875	.4684
.1637	48.4375	.6076
.1683	54.6875	.6962
.1728	62.5000	.7215
.1774	68.7500	.4177
.1819	71.8750	.4304
.1865	78.1250	.6835
.1910	84.3750	.2785
.1956	84.3750	.0759
.2001	87.5000	.5190
.2046	93.7500	.4177
.2092	95.3125	.0127
.2137	95.3125	.1646
.2183	98.4375	.1772
.2228	98.4375	.0000
.2274	98.4375	.0000
.2319	98.4375	.0000
.2365	98.4375	.0000
.2410	98.4375	.0886
.2455	100.0000	.0886
.2501	100.0000	.0000
.2546	100.0000	.0000
.2592	100.0000	.0000

FILE: MCOAF4
DATA: .32169 2.74590 .73415 2.20250 .91530 .96508
NUMBER OF RANDOM OUTCOMES : 1000

RANGES OF REFLECTION COEFFICIENTS : .0878 .1676

THRESHOLD	YIELD %	PROB. DENSITY
.0795	.0000	.0000
.0822	.0000	.0000
.0850	.0000	.0030
.0878	.1000	.0151
.0905	.4000	.0535
.0933	1.2000	.0618
.0960	1.7000	.0437
.0988	2.3000	.0761
.1015	3.4000	.1145
.1043	4.7000	.0867
.1070	5.7000	.1914
.1098	9.2000	.3768
.1125	14.0000	.5614
.1153	21.1000	.5569
.1181	26.4000	.5923
.1208	34.5000	.7197
.1236	42.6000	1.0000
.1263	55.2000	.7905
.1291	59.3000	.2909
.1318	63.2000	.3866
.1346	68.0000	.4574
.1373	73.5000	.6217
.1401	81.0000	.5260
.1428	84.7000	.2788
.1456	87.8000	.2803
.1484	90.9000	.2630
.1511	93.4000	.1696
.1539	94.6000	.0467
.1566	94.9000	.0874
.1594	96.7000	.1899
.1621	98.6000	.1002
.1649	99.0000	.0595
.1676	100.0000	.0497
.1704	100.0000	.0000
.1732	100.0000	.0000
.1759	100.0000	.0000

FILE: VAOAF4
DATA: .32169 2.74590 .73415 2.20250 .91530 .96508
NUMBER OF VERTICES : 64

RANGES OF REFLECTION COEFFICIENTS : .0874 .2613

THRESHOLD	YIELD %	PROB. DENSITY
.0694	.0000	.0000
.0754	.0000	.0000
.0814	.0000	.1077
.0874	1.5625	.1077
.0934	1.5625	.0000
.0994	1.5625	.0000
.1054	1.5625	.4308
.1114	7.8125	.4000
.1174	7.8125	.0923
.1234	10.9375	.6154
.1294	17.1875	.5538
.1354	20.3125	.5077
.1414	26.5625	.9077
.1474	34.3750	.6462
.1534	37.5000	.4000
.1594	42.1875	.6462
.1654	48.4375	.8615
.1714	56.2500	.8615
.1774	62.5000	.5692
.1834	67.1875	1.0000
.1894	78.1250	.7538
.1954	79.6875	.4308
.2013	85.9375	.3538
.2073	85.9375	.3385
.2133	92.1875	.6462
.2193	95.3125	.1538
.2253	95.3125	.0000
.2313	95.3125	.2154
.2373	98.4375	.2154
.2433	98.4375	.0000
.2493	98.4375	.0000
.2553	98.4375	.1077
.2613	100.0000	.1077
.2673	100.0000	.0000
.2733	100.0000	.0000
.2793	100.0000	.0000
.2853	100.0000	.0000

FILE: MCODF21
DATA: .31201 2.80780 .73944 2.21830 .93594 .93601
NUMBER OF RANDOM OUTCOMES : 1000

RANGES OF REFLECTION COEFFICIENTS : .1108 .1741

THRESHOLD	YIELD %	PROB. DENSITY
.1043	.0000	.0000
.1064	.0000	.0000
.1086	.0000	.0000
.1108	.1000	.2210
.1130	3.7000	.6448
.1152	9.0000	.5032
.1174	11.1000	.1631
.1195	12.4000	.2972
.1217	15.7000	.3948
.1239	18.1000	.2489
.1261	19.9000	.2940
.1283	22.8000	.3680
.1304	25.9000	.5687
.1326	31.8000	.8755
.1348	38.9000	.8594
.1370	45.2000	.9056
.1392	53.0000	1.0000
.1414	60.2000	.8358
.1435	65.7000	.5333
.1457	68.9000	.4399
.1479	72.9000	.5097
.1501	76.8000	.5665
.1523	81.4000	.4925
.1545	84.1000	.2296
.1566	85.4000	.2071
.1588	87.4000	.1964
.1610	88.5000	.1942
.1632	90.6000	.2961
.1654	92.9000	.2800
.1676	95.0000	.3122
.1697	97.6000	.2758
.1719	99.1000	.1524
.1741	100.0000	.0515
.1763	100.0000	.0000
.1785	100.0000	.0000
.1806	100.0000	.0000
.1828	100.0000	.0000

FILE: VAODF21
DATA: .31201 2.80780 .73944 2.21830 .93594 .93601
NUMBER OF VERTICES : 64

RANGES OF REFLECTION COEFFICIENTS : .1205 .2515

THRESHOLD	YIELD %	PROB. DENSITY
.1070	.0000	.0000
.1115	.0000	.0000
.1160	.0000	.0725
.1205	1.5625	.2754
.1250	4.6875	.3623
.1296	7.8125	.3623
.1341	10.9375	.2174
.1386	12.5000	.3913
.1431	18.7500	1.0000
.1476	28.1250	.5217
.1521	28.1250	.0580
.1567	31.2500	.5652
.1612	37.5000	.6377
.1657	42.1875	.5217
.1702	46.8750	.4058
.1747	50.0000	.5072
.1792	56.2500	.7536
.1838	62.5000	.5217
.1883	65.6250	.3188
.1928	68.7500	.3188
.1973	71.8750	.5362
.2018	78.1250	.6232
.2063	82.8125	.6232
.2109	89.0625	.5652
.2154	92.1875	.1449
.2199	92.1875	.0000
.2244	92.1875	.2029
.2289	95.3125	.2029
.2334	95.3125	.0000
.2380	95.3125	.1014
.2425	96.8750	.0725
.2470	96.8750	.1884
.2515	100.0000	.2029
.2560	100.0000	.0000
.2605	100.0000	.0000
.2651	100.0000	.0000
.2696	100.0000	.0000

FILE: MCODF7
DATA: .31868 2.79830 .74101 2.22310 .93274 .95606
NUMBER OF RANDOM OUTCOMES : 1000

RANGES OF REFLECTION COEFFICIENTS : .0979 .1624

THRESHOLD	YIELD %	PROB. DENSITY
.0913	.0000	.0000
.0935	.0000	.0000
.0957	.0000	.0008
.0979	.1000	.0311
.1002	.7000	.0705
.1024	1.5000	.0538
.1046	1.9000	.0386
.1068	2.6000	.1212
.1091	4.4000	.1333
.1113	5.5000	.1227
.1135	7.5000	.2674
.1157	11.2000	.3220
.1179	14.7000	.3992
.1202	20.6000	.6977
.1224	30.0000	1.0000
.1246	41.5000	.9288
.1268	49.9000	.7053
.1291	57.2000	.5795
.1313	62.5000	.3750
.1335	65.8000	.2886
.1357	69.2000	.3114
.1379	72.7000	.3462
.1402	76.6000	.3159
.1424	79.3000	.1561
.1446	80.3000	.0947
.1468	81.7000	.1212
.1491	83.3000	.2530
.1513	87.3000	.4144
.1535	91.7000	.3174
.1557	94.2000	.2061
.1579	96.6000	.2462
.1602	99.3000	.1621
.1624	100.0000	.0167
.1646	100.0000	.0000
.1668	100.0000	.0000
.1691	100.0000	.0000

FILE: VAODF7
DATA: .31868 2.79830 .74101 2.22310 .93274 .95606
NUMBER OF VERTICES : 64

RANGES OF REFLECTION COEFFICIENTS : .1062 .2513

THRESHOLD	YIELD %	PROB. DENSITY
.0912	.0000	.0000
.0962	.0000	.0000
.1012	.0000	.1045
.1062	1.5625	.0746
.1112	1.5625	.1642
.1162	4.6875	.4179
.1212	7.8125	.1493
.1262	7.8125	.0896
.1312	10.9375	.8060
.1362	20.3125	.8060
.1412	23.4375	.0149
.1462	23.4375	.6866
.1512	34.3750	.7761
.1562	35.9375	.3881
.1612	42.1875	.5522
.1662	45.3125	.4776
.1712	51.5625	1.0000
.1763	60.9375	.6716
.1813	62.5000	.0000
.1863	62.5000	.2388
.1913	67.1875	.6716
.1963	73.4375	.7612
.2013	79.6875	.5075
.2063	82.8125	.5373
.2113	89.0625	.5970
.2163	92.1875	.1194
.2213	92.1875	.1791
.2263	95.3125	.2090
.2313	95.3125	.0000
.2363	95.3125	.2090
.2413	98.4375	.1940
.2463	98.4375	.0746
.2513	100.0000	.1045
.2563	100.0000	.0000
.2613	100.0000	.0000
.2663	100.0000	.0000
.2713	100.0000	.0000

FILE: MCODF4
DATA: .33519 2.82960 .75354 2.26060 .94320 1.00560
NUMBER OF RANDOM OUTCOMES : 1000

RANGES OF REFLECTION COEFFICIENTS : .0788 .1862

THRESHOLD	YIELD %	PROB. DENSITY
.0677	.0000	.0000
.0714	.0000	.0000
.0751	.0000	.0000
.0788	.1000	.1564
.0825	2.5000	.2259
.0862	3.8000	.1747
.0899	6.2000	.4710
.0936	11.6000	.5705
.0973	16.1000	.7249
.1010	23.9000	.7973
.1047	29.5000	.7008
.1084	36.2000	.7403
.1121	41.9000	.5936
.1158	46.4000	.4382
.1196	49.6000	.2886
.1233	52.4000	.6110
.1270	60.0000	.8427
.1307	66.3000	.7490
.1344	73.5000	1.0000
.1381	82.8000	.9286
.1418	88.4000	.3349
.1455	89.3000	.0878
.1492	90.8000	.2297
.1529	92.9000	.1535
.1566	93.4000	.0647
.1603	94.2000	.0656
.1640	94.5000	.0396
.1677	94.9000	.0241
.1714	94.9000	.0000
.1751	94.9000	.0454
.1788	96.0000	.2674
.1825	99.0000	.2597
.1862	100.0000	.0386
.1899	100.0000	.0000
.1936	100.0000	.0000
.1973	100.0000	.0000
.2010	100.0000	.0000

FILE: VAODF4
DATA: .33519 2.82960 .75354 2.26060 .94320 1.00560
NUMBER OF VERTICES : 64

RANGES OF REFLECTION COEFFICIENTS : .1079 .2810

THRESHOLD	YIELD %	PROB. DENSITY
.0900	.0000	.0000
.0960	.0000	.0000
.1019	.0000	.0811
.1079	1.5625	.1622
.1139	3.1250	.2568
.1198	6.2500	.1757
.1258	7.8125	.6757
.1318	18.7500	1.0000
.1377	25.0000	.4459
.1437	28.1250	.2973
.1497	31.2500	.2703
.1556	34.3750	.7297
.1616	43.7500	.5405
.1676	43.7500	.0000
.1735	43.7500	.3243
.1795	50.0000	.7432
.1855	56.2500	.3649
.1915	57.8125	.3919
.1974	64.0625	.4865
.2034	67.1875	.5541
.2094	75.0000	.7973
.2153	81.2500	.4730
.2213	84.3750	.2838
.2273	87.5000	.4459
.2332	92.1875	.2568
.2392	92.1875	.0000
.2452	92.1875	.1622
.2511	95.3125	.3784
.2571	98.4375	.1622
.2631	98.4375	.0000
.2690	98.4375	.0000
.2750	98.4375	.0946
.2810	100.0000	.0946
.2869	100.0000	.0000
.2929	100.0000	.0000
.2989	100.0000	.0000

FILE: MCOEF21
DATA: .31528 2.84220 .75265 2.23650 .95296 .95171
NUMBER OF RANDOM OUTCOMES : 1000

RANGES OF REFLECTION COEFFICIENTS : .1083 .2004

THRESHOLD	YIELD %	PROB. DENSITY
.0988	.0000	.0000
.1020	.0000	.0000
.1051	.0000	.0000
.1083	.1000	.1994
.1115	4.1000	.7840
.1147	12.3000	.8210
.1178	17.0000	.3385
.1210	18.9000	.2121
.1242	22.1000	.7558
.1274	31.3000	1.0000
.1305	38.5000	.9270
.1337	47.3000	.9854
.1369	54.8000	.7578
.1401	60.4000	.5817
.1432	65.4000	.7121
.1464	72.3000	.6848
.1496	76.8000	.5117
.1528	81.2000	.3979
.1559	84.0000	.4484
.1591	89.0000	.5545
.1623	93.1000	.4912
.1655	97.0000	.2529
.1686	97.5000	.0399
.1718	98.2000	.0691
.1750	98.6000	.0272
.1782	98.7000	.0019
.1813	98.7000	.0058
.1845	98.8000	.0058
.1877	98.8000	.0019
.1909	98.9000	.0321
.1940	99.3000	.0350
.1972	99.5000	.0438
.2004	100.0000	.0321
.2036	100.0000	.0000
.2067	100.0000	.0000
.2099	100.0000	.0000
.2131	100.0000	.0000

FILE: VAOEF21
DATA: .31528 2.84220 .75265 2.23650 .95296 .95171
NUMBER OF VERTICES : 64

RANGES OF REFLECTION COEFFICIENTS : .1122 .2804

THRESHOLD	YIELD %	PROB. DENSITY
.0948	.0000	.0000
.1006	.0000	.0000
.1064	.0000	.0667
.1122	1.5625	.2667
.1180	4.6875	.2533
.1238	6.2500	.1200
.1296	7.8125	.2667
.1354	12.5000	.8933
.1412	23.4375	.8000
.1470	26.5625	.0000
.1528	26.5625	.5733
.1586	37.5000	1.0000
.1644	43.7500	.4667
.1702	46.8750	.0667
.1760	46.8750	.4267
.1818	54.6875	.5600
.1876	56.2500	.0000
.1934	56.2500	.3733
.1992	64.0625	1.0000
.2050	73.4375	.6267
.2108	76.5625	.4533
.2166	82.8125	.5333
.2224	85.9375	.1067
.2282	85.9375	.1600
.2340	89.0625	.1600
.2398	89.0625	.1333
.2456	92.1875	.3733
.2514	95.3125	.1600
.2572	95.3125	.0000
.2630	95.3125	.0933
.2688	96.8750	.0667
.2746	96.8750	.1733
.2804	100.0000	.1867
.2862	100.0000	.0000
.2920	100.0000	.0000
.2978	100.0000	.0000
.3036	100.0000	.0000

FILE: MCOEF7
DATA: .32132 2.82360 .75158 2.23590 .94673 .97201
NUMBER OF RANDOM OUTCOMES : 1000

RANGES OF REFLECTION COEFFICIENTS : .0977 .1779

THRESHOLD	YIELD %	PROB. DENSITY
.0894	.0000	.0000
.0922	.0000	.0000
.0949	.0000	.0007
.0977	.1000	.0179
.1005	.7000	.1234
.1032	3.0000	.2097
.1060	5.3000	.1324
.1088	6.5000	.1448
.1115	9.5000	.3862
.1143	15.6000	.5262
.1171	22.1000	.6131
.1198	31.0000	.9331
.1226	43.8000	1.0000
.1254	53.9000	.6717
.1281	60.3000	.4676
.1309	65.6000	.3766
.1337	69.6000	.3359
.1364	73.7000	.2800
.1392	76.4000	.2352
.1420	79.4000	.1807
.1447	81.1000	.2317
.1475	85.1000	.3186
.1503	88.4000	.2593
.1530	91.6000	.3076
.1558	95.5000	.2476
.1585	97.3000	.0938
.1613	98.1000	.0600
.1641	98.8000	.0269
.1668	98.8000	.0028
.1696	99.0000	.0228
.1724	99.3000	.0193
.1751	99.5000	.0317
.1779	100.0000	.0228
.1807	100.0000	.0000
.1834	100.0000	.0000
.1862	100.0000	.0000
.1890	100.0000	.0000

FILE: VAOEF7
DATA: .32132 2.82360 .75158 2.23590 .94673 .97201
NUMBER OF VERTICES : 64

RANGES OF REFLECTION COEFFICIENTS : .1066 .2605

THRESHOLD	YIELD %	PROB. DENSITY
.0906	.0000	.0000
.0959	.0000	.0000
.1012	.0000	.1000
.1066	1.5625	.2333
.1119	3.1250	.0667
.1172	3.1250	.1333
.1225	6.2500	.7667
.1278	14.0625	.8833
.1331	18.7500	.3000
.1384	20.3125	.6000
.1437	28.1250	.8500
.1490	32.8125	.7333
.1543	39.0625	.4167
.1597	39.0625	.0000
.1650	39.0625	.5167
.1703	46.8750	1.0000
.1756	53.1250	.7000
.1809	57.8125	.5000
.1862	60.9375	.2500
.1915	62.5000	.3833
.1968	67.1875	.6333
.2021	71.8750	.5667
.2074	76.5625	.8667
.2128	84.3750	.6500
.2181	85.9375	.0000
.2234	85.9375	.3000
.2287	90.6250	.5833
.2340	93.7500	.1667
.2393	93.7500	.0833
.2446	95.3125	.1167
.2499	95.3125	.0000
.2552	95.3125	.3500
.2605	100.0000	.3500
.2658	100.0000	.0000
.2712	100.0000	.0000
.2765	100.0000	.0000
.2818	100.0000	.0000

FILE: MCOEF4
DATA: .33846 2.85090 .76256 2.27120 .95592 1.02640
NUMBER OF RANDOM OUTCOMES : 1000

RANGES OF REFLECTION COEFFICIENTS : .0818 .1964

THRESHOLD	YIELD %	PROB. DENSITY
.0700	.0000	.0000
.0739	.0000	.0000
.0779	.0000	.0000
.0818	.1000	.1997
.0858	5.2000	.4819
.0897	11.3000	.4502
.0937	16.5000	.4094
.0976	22.2000	.5656
.1016	30.3000	.5761
.1055	35.9000	.3138
.1095	38.7000	.2136
.1134	41.8000	.2531
.1174	45.1000	.2650
.1213	48.7000	.3652
.1253	53.7000	.2531
.1292	55.2000	.1318
.1332	58.7000	.5313
.1371	68.7000	1.0000
.1411	81.1000	.5531
.1450	82.7000	.1595
.1490	86.8000	.3250
.1529	90.1000	.1549
.1569	91.0000	.1002
.1608	92.8000	.0910
.1648	93.2000	.0356
.1687	93.9000	.0508
.1727	94.4000	.0310
.1766	94.7000	.0198
.1806	94.9000	.0000
.1845	94.9000	.1055
.1885	97.4000	.1668
.1924	98.7000	.1035
.1964	100.0000	.0514
.2003	100.0000	.0000
.2043	100.0000	.0000
.2082	100.0000	.0000

FILE: VAOEF4
DATA: .33846 2.85090 .76256 2.27120 .95592 1.02640
NUMBER OF VERTICES : 64

RANGES OF REFLECTION COEFFICIENTS : .0992 .2899

THRESHOLD	YIELD %	PROB. DENSITY
.0795	.0000	.0000
.0860	.0000	.0000
.0926	.0000	.0833
.0992	1.5625	.1806
.1058	3.1250	.1667
.1123	4.6875	.1528
.1189	6.2500	.2500
.1255	9.3750	.2778
.1321	12.5000	.8194
.1387	23.4375	.8194
.1452	26.5625	.2361
.1518	29.6875	.5417
.1584	35.9375	.4028
.1650	37.5000	.4306
.1715	43.7500	.3333
.1781	43.7500	.2222
.1847	48.4375	.3472
.1913	50.0000	.3194
.1978	54.6875	.3611
.2044	57.8125	.8889
.2110	70.3125	1.0000
.2176	75.0000	.4444
.2242	79.6875	.4167
.2307	82.8125	.3056
.2373	85.9375	.4583
.2439	90.6250	.2500
.2505	90.6250	.0417
.2570	92.1875	.1528
.2636	93.7500	.3750
.2702	98.4375	.2778
.2768	98.4375	.0000
.2833	98.4375	.0972
.2899	100.0000	.0972
.2965	100.0000	.0000
.3031	100.0000	.0000
.3097	100.0000	.0000
.3162	100.0000	.0000

FILE: MCOASTP
DATA: .31262 2.82020 .74225 2.22680 .94001 .93787
NUMBER OF RANDOM OUTCOMES : 1000

RANGES OF REFLECTION COEFFICIENTS : .1098 .1827

THRESHOLD	YIELD %	PROB. DENSITY
.1023	.0000	.0000
.1048	.0000	.0000
.1073	.0000	.0000
.1098	.1000	.1463
.1124	3.2000	.5592
.1149	9.3000	.4560
.1174	11.3000	.2208
.1199	14.1000	.3178
.1224	17.0000	.2971
.1249	19.5000	.2181
.1274	21.4000	.2567
.1300	25.0000	.6167
.1325	32.4000	.7738
.1350	38.8000	.6759
.1375	45.6000	.9093
.1400	55.3000	1.0000
.1425	63.1000	.6284
.1450	67.4000	.4587
.1475	72.4000	.6293
.1501	78.6000	.5754
.1526	82.6000	.3223
.1551	84.9000	.2217
.1576	86.9000	.1724
.1601	88.3000	.1957
.1626	90.6000	.2370
.1651	92.7000	.2765
.1677	95.7000	.3294
.1702	98.3000	.1580
.1727	98.7000	.0251
.1752	99.1000	.0314
.1777	99.3000	.0242
.1802	99.6000	.0422
.1827	100.0000	.0224
.1852	100.0000	.0000
.1878	100.0000	.0000
.1903	100.0000	.0000

FILE: VAOASTP
DATA: .31262 2.82020 .74225 2.22680 .94001 .93787
NUMBER OF VERTICES : 64

RANGES OF REFLECTION COEFFICIENTS : .1193 .2610

THRESHOLD	YIELD %	PROB. DENSITY
.1046	.0000	.0000
.1095	.0000	.0000
.1144	.0000	.0870
.1193	1.5625	.1739
.1242	3.1250	.2464
.1290	6.2500	.4783
.1339	10.9375	.2899
.1388	12.5000	.6087
.1437	21.8750	1.0000
.1486	28.1250	.2899
.1535	28.1250	.0580
.1584	31.2500	.7536
.1632	40.6250	.9855
.1681	46.8750	.3188
.1730	46.8750	.0000
.1779	46.8750	.5507
.1828	56.2500	.9855
.1877	62.5000	.4638
.1926	65.6250	.5072
.1974	71.8750	.6232
.2023	76.5625	.6232
.2072	82.8125	.5362
.2121	85.9375	.3478
.2170	89.0625	.1449
.2219	89.0625	.1739
.2268	92.1875	.1884
.2317	92.1875	.0435
.2365	93.7500	.3043
.2414	96.8750	.1884
.2463	96.8750	.0000
.2512	96.8750	.0000
.2561	96.8750	.2029
.2610	100.0000	.2029
.2659	100.0000	.0000
.2707	100.0000	.0000
.2756	100.0000	.0000
.2805	100.0000	.0000

FILE: MCOESTP
DATA: .31791 2.86980 .75827 2.25590 .96130 .96100
NUMBER OF RANDOM OUTCOMES : 1000

RANGES OF REFLECTION COEFFICIENTS : .1063 .2198

THRESHOLD	YIELD %	PROB. DENSITY
.0945	.0000	.0000
.0985	.0000	.0000
.1024	.0000	.0000
.1063	.1000	.1998
.1102	4.8000	.6117
.1141	12.2000	.5294
.1180	16.6000	.5530
.1219	25.1000	.8932
.1259	35.5000	1.0000
.1298	46.3000	.9268
.1337	55.1000	.6423
.1376	60.4000	.3692
.1415	64.1000	.4432
.1454	69.9000	.4142
.1493	73.0000	.3059
.1533	77.3000	.4828
.1572	83.2000	.5309
.1611	88.2000	.3333
.1650	90.6000	.1960
.1689	92.8000	.1716
.1728	94.3000	.1053
.1767	95.3000	.1190
.1807	96.8000	.0915
.1846	97.2000	.0229
.1885	97.5000	.0290
.1924	97.9000	.0557
.1963	98.6000	.0389
.2002	98.7000	.0053
.2041	98.8000	.0015
.2080	98.8000	.0183
.2120	99.2000	.0336
.2159	99.5000	.0397
.2198	100.0000	.0244
.2237	100.0000	.0000
.2276	100.0000	.0000
.2315	100.0000	.0000

FILE: VAOESTP
DATA: .31791 2.86980 .75827 2.25590 .96130 .96100
NUMBER OF VERTICES : 64

RANGES OF REFLECTION COEFFICIENTS : .1074 .2997

THRESHOLD	YIELD %	PROB. DENSITY
.0875	.0000	.0000
.0942	.0000	.0000
.1008	.0000	.0667
.1074	1.5625	.2667
.1141	4.6875	.2533
.1207	6.2500	.0933
.1273	7.8125	.4667
.1340	15.6250	1.0000
.1406	25.0000	.5200
.1472	26.5625	.4400
.1539	34.3750	.6800
.1605	39.0625	.5733
.1671	45.3125	.3867
.1738	46.8750	.2933
.1804	51.5625	.4533
.1870	54.6875	.1200
.1936	54.6875	.1067
.2003	57.8125	.4933
.2069	64.0625	.7467
.2135	71.8750	.8533
.2202	79.6875	.5867
.2268	82.8125	.1200
.2334	82.8125	.0000
.2401	82.8125	.0400
.2467	84.3750	.4667
.2533	90.6250	.3333
.2600	90.6250	.1200
.2666	93.7500	.2800
.2732	95.3125	.0667
.2799	95.3125	.0000
.2865	95.3125	.0000
.2931	95.3125	.2800
.2997	100.0000	.2800
.3064	100.0000	.0000
.3130	100.0000	.0000
.3196	100.0000	.0000