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SECONDARY PARTICLE YIELDS PRODUCED BY 400 AND 500 GeV/c PROTONS INTERACTING ON H, Be AND Pb

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October 19, 1970

A program SPUKJ was written by J. Ranft[1] to calculate particle yields from p-p collisions according to the thermodynamical model[2]. The program was modified by Ranft to predict yields from p-nucleus collisions[3] as well. The program was further modified at NAL by Aspasia Nelson for Calcomp plotting.

Here we present the yields $d^2N/d\Omega dp$ for p-p, p-Be and p-Pb interactions at 400 and 500 GeV/c using the latest available version of SPUKJ[4]. Yields for 200 GeV/c protons have been made available before[5].

The graphs shown refer to the lab system. The program can also generate plots of $d^2N/d\Omega dp$ and $d^2N/dp_\perp dp_{/\!/}$ in the C of M system. The numbers appearing on top of each graph (except for Figures 7, 8, 9) are the parameters used in the model[1] (based on fitting available data).

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FIGURE IDENTIFICATION NUMBER

Targets:	H	Be	Pb
p	1a,b	10	16
π^+	2	11	17
π^-	3	12	18
K^+	4	13	19
K^-	5	14	20
$\bar{p}$	6	15	21
Λ°	7	--	--
Σ^+	8	--	--
Ξ	9	--	--

Subscripts a and b refer to 400 and 500 GeV respectively.

REFERENCES

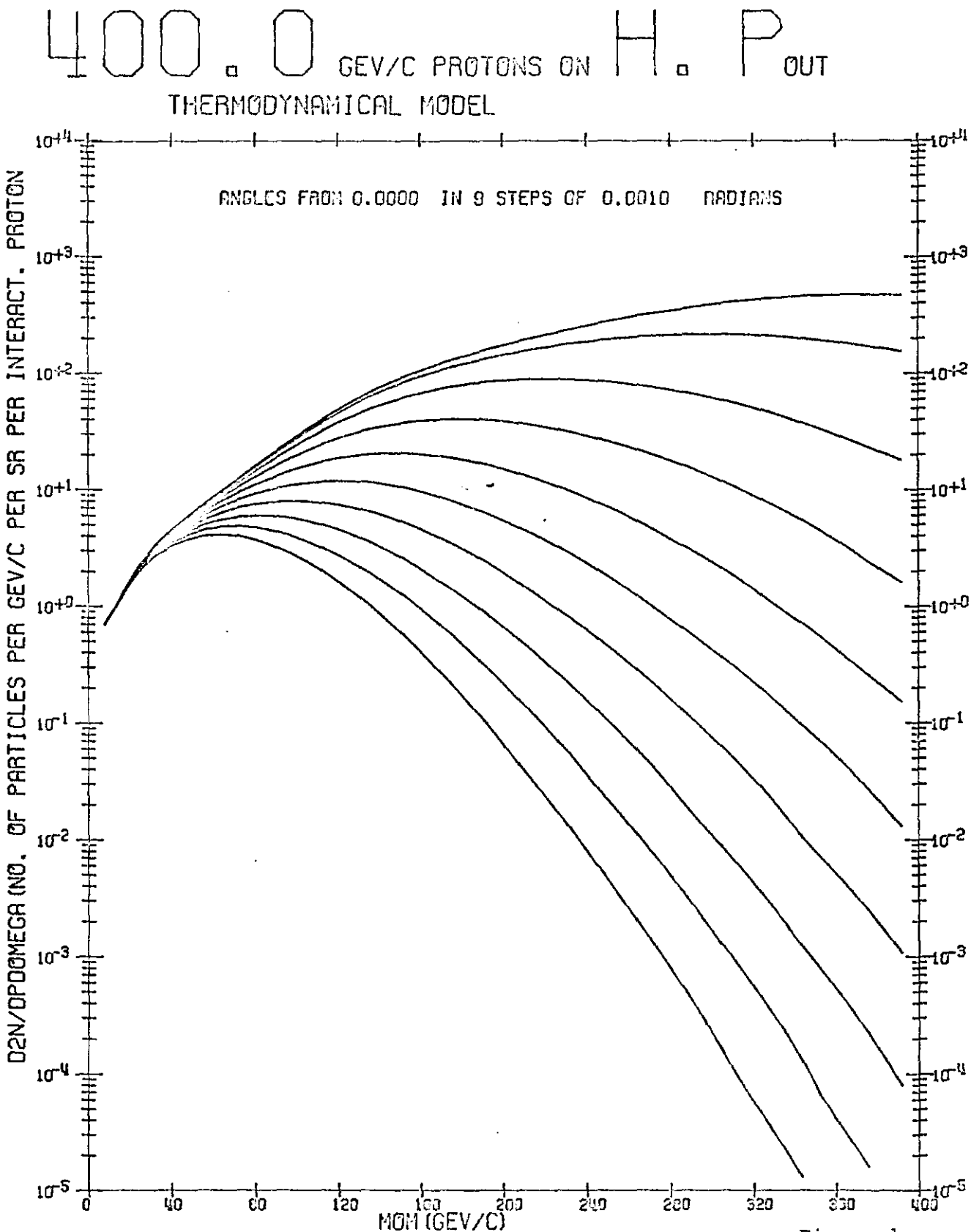
1 - J. Ranft, "The Computer Programme SPUKJ . . .", Karl-Marx U., TUL-37, July, 1970.

2 - R. Hagedorn & J. Ranft, "Statistical Thermodynamics of Strong Interactions At High Energies", Suppl. Nuovo Cimento I, 6, 169 (1968).

3 - J. Ranft, "Secondary Particle Spectra According to the Thermodynamical Model. A Fit to Data Measured in p-Nucleus Collisions", Karl-Marx U., TUL-36, July, 1970.

4 - H. Grote, private communication, Aug. 26, 1970.

5 - M. Awschalom & T. O. White, "Secondary Particle Production At 200 GeV", NAL-FN-191, June 9, 1969.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THERMODYNAMICAL MODEL
ANGLES FROM 0.0000 IN 9 STEPS OF 0.0010 RADIANS
D2N/DPDOMEGA (NO. OF PARTICLES PER GEV/C PER SR PER INTERACT. PROTON
MOM (GEV/C)
0
40
80
120
160
200
240
280
320
360
400

Figure 1a

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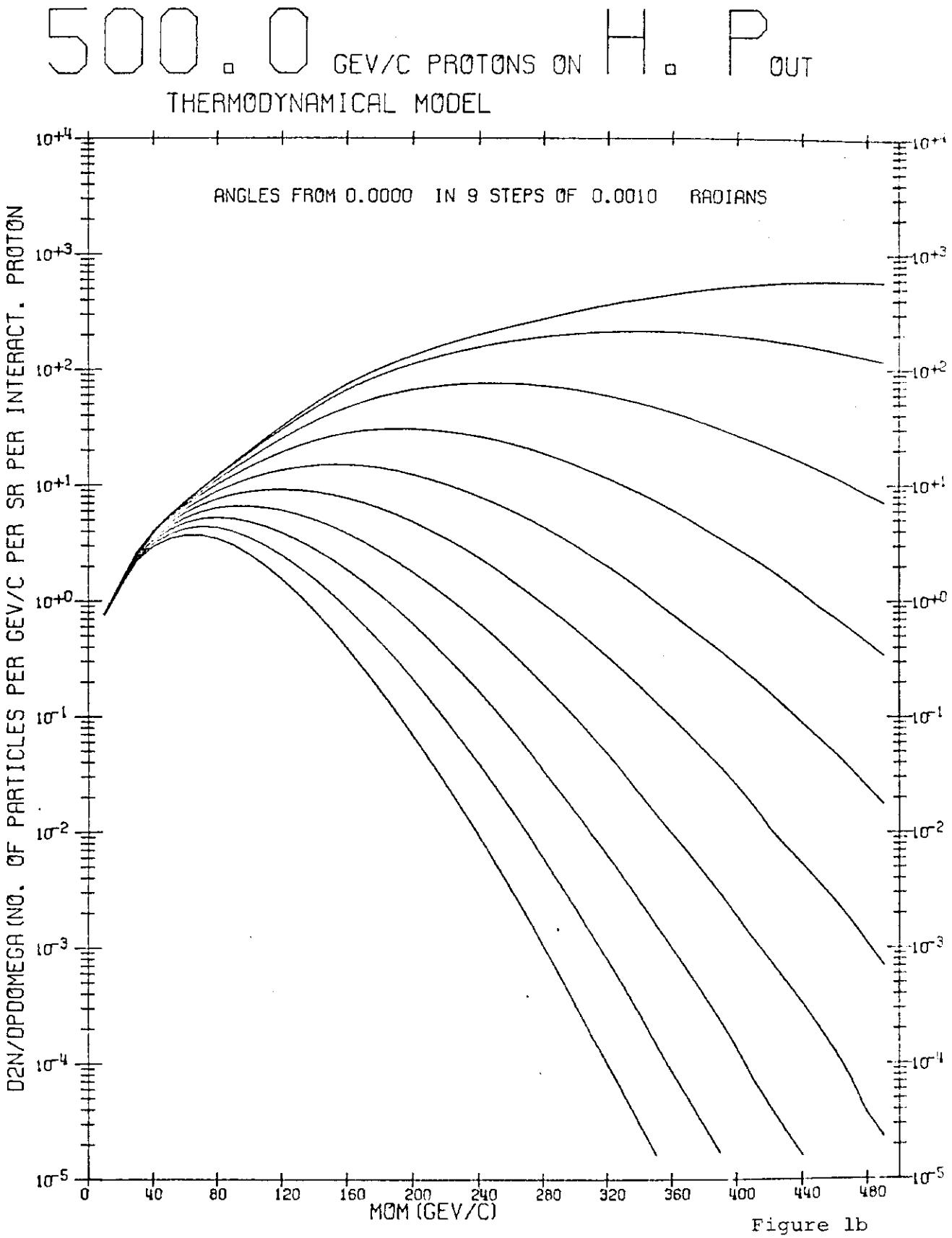

Figure 1b

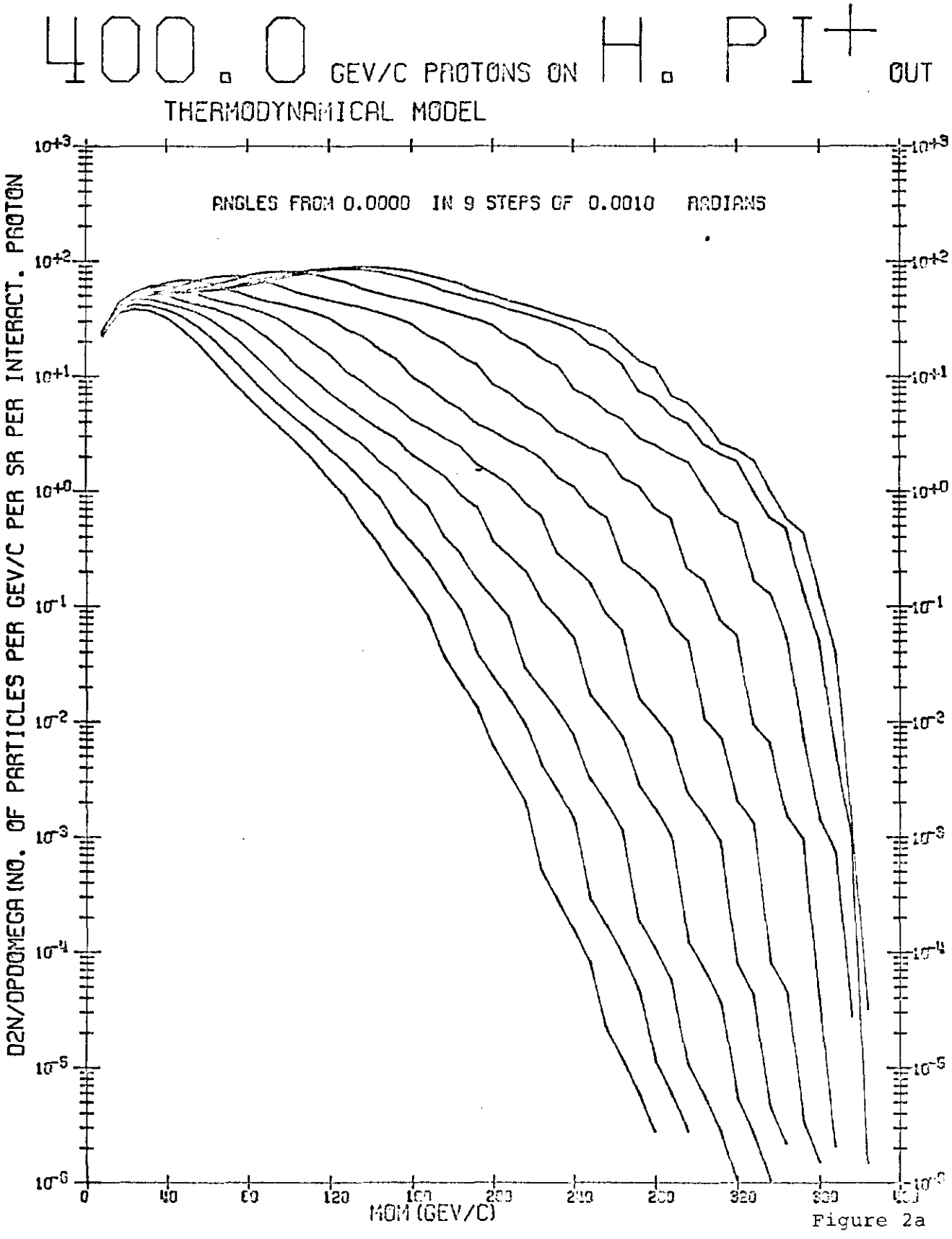
400.0 GEV/C PROTONS ON H. PI+ OUT
THERMODYNAMICAL MODEL
ANGLES FROM 0.0000 IN 9 STEPS OF 0.0010 RADIANS
D2N/DPDOMEGA (NO. OF PARTICLES PER GEV/C PER SR PER INTERACT. PROTON
MOM (GEV/C)

Figure 2a

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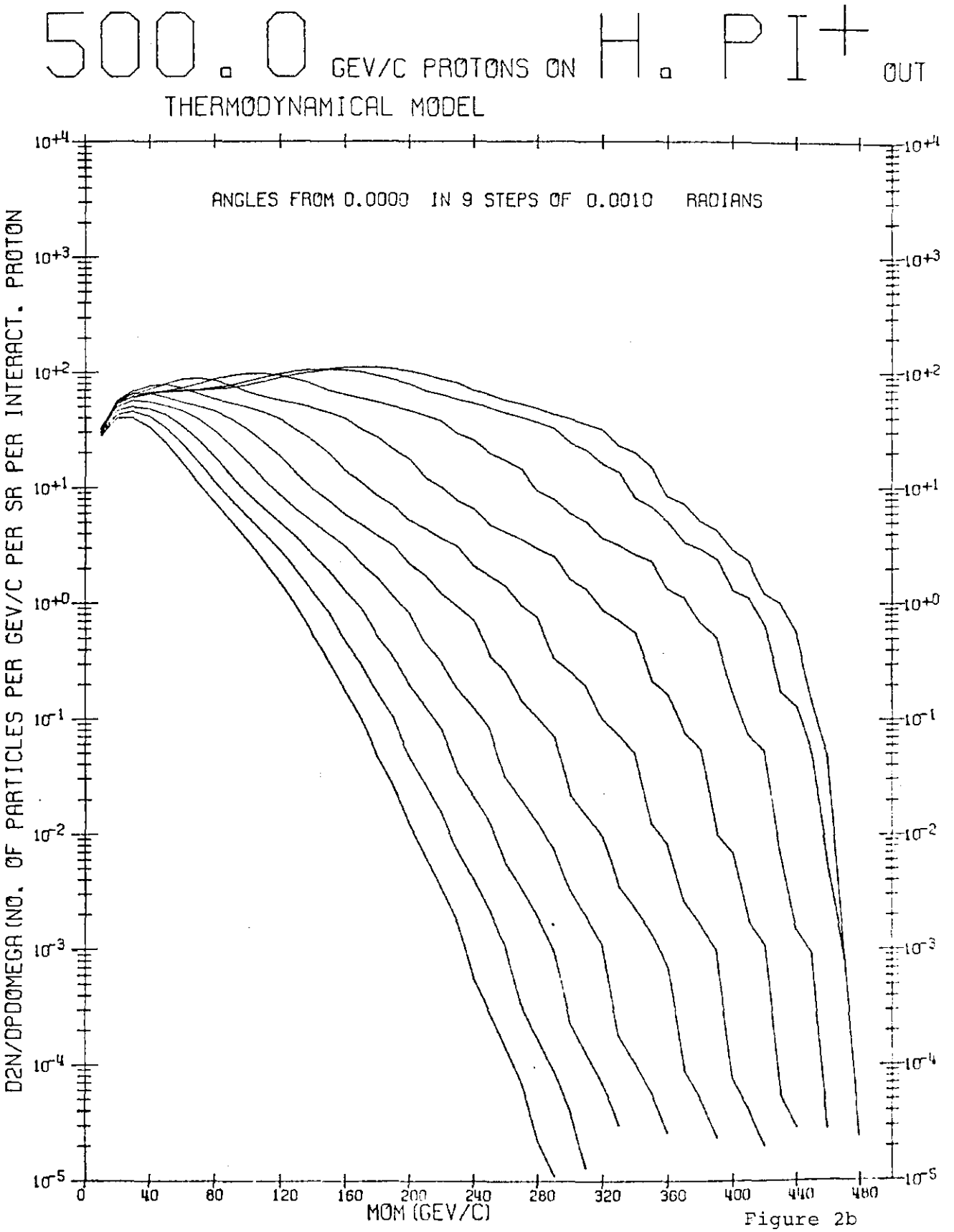

Figure 2b

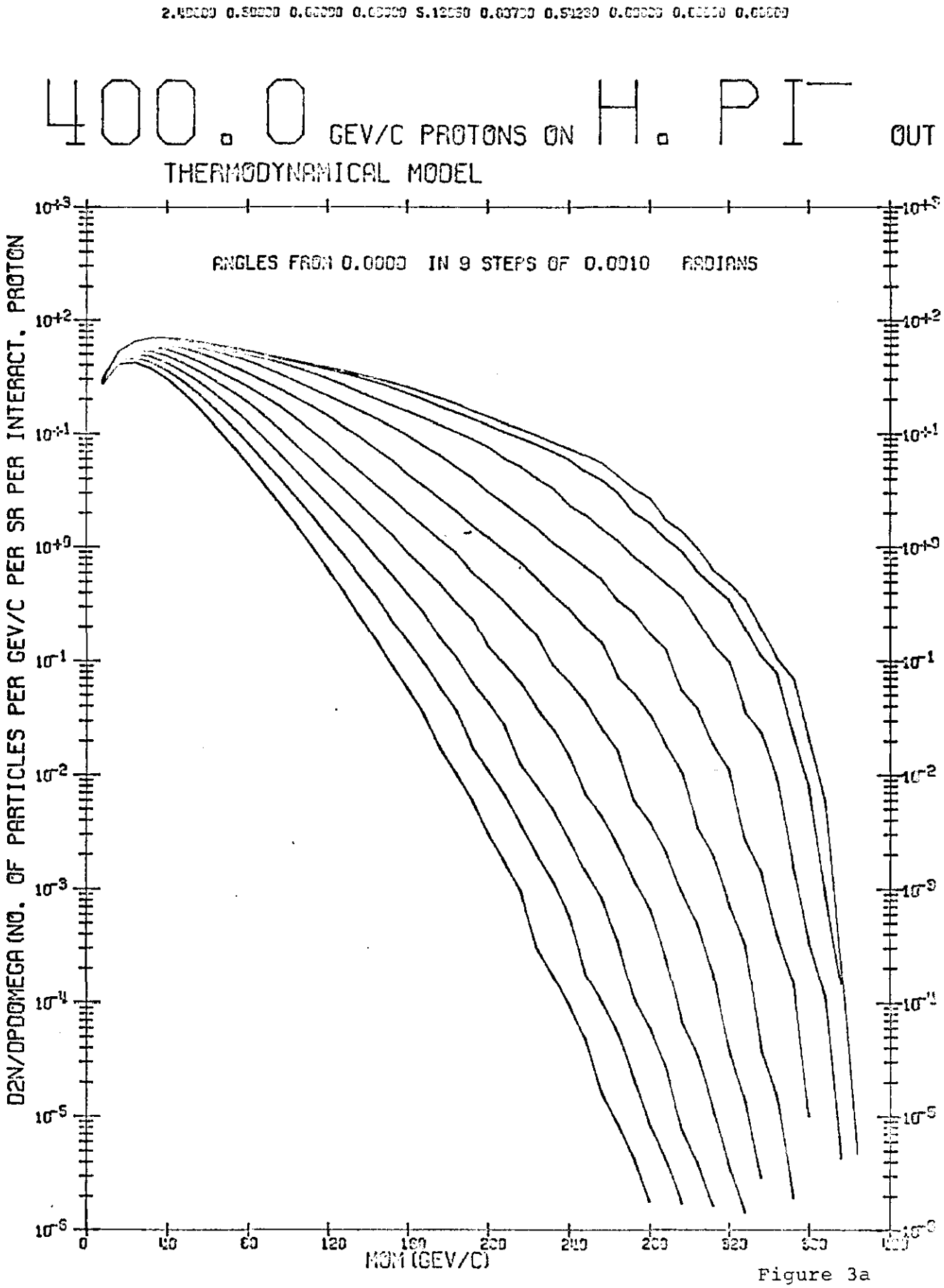
400.0 GEV/C PROTONS ON H. PI- OUT
THERMODYNAMICAL MODEL
ANGLES FROM 0.0000 IN 9 STEPS OF 0.0010 RADIANS
D2N/DPDOMEGA (NO. OF PARTICLES PER GEV/C PER SR PER INTERACT. PROTON
MOM (GEV/C)

Figure 3a

2.40000 0.50000 0.00000 0.00000 5.13050 0.83780 0.54230 0.00000 0.00000 0.00000

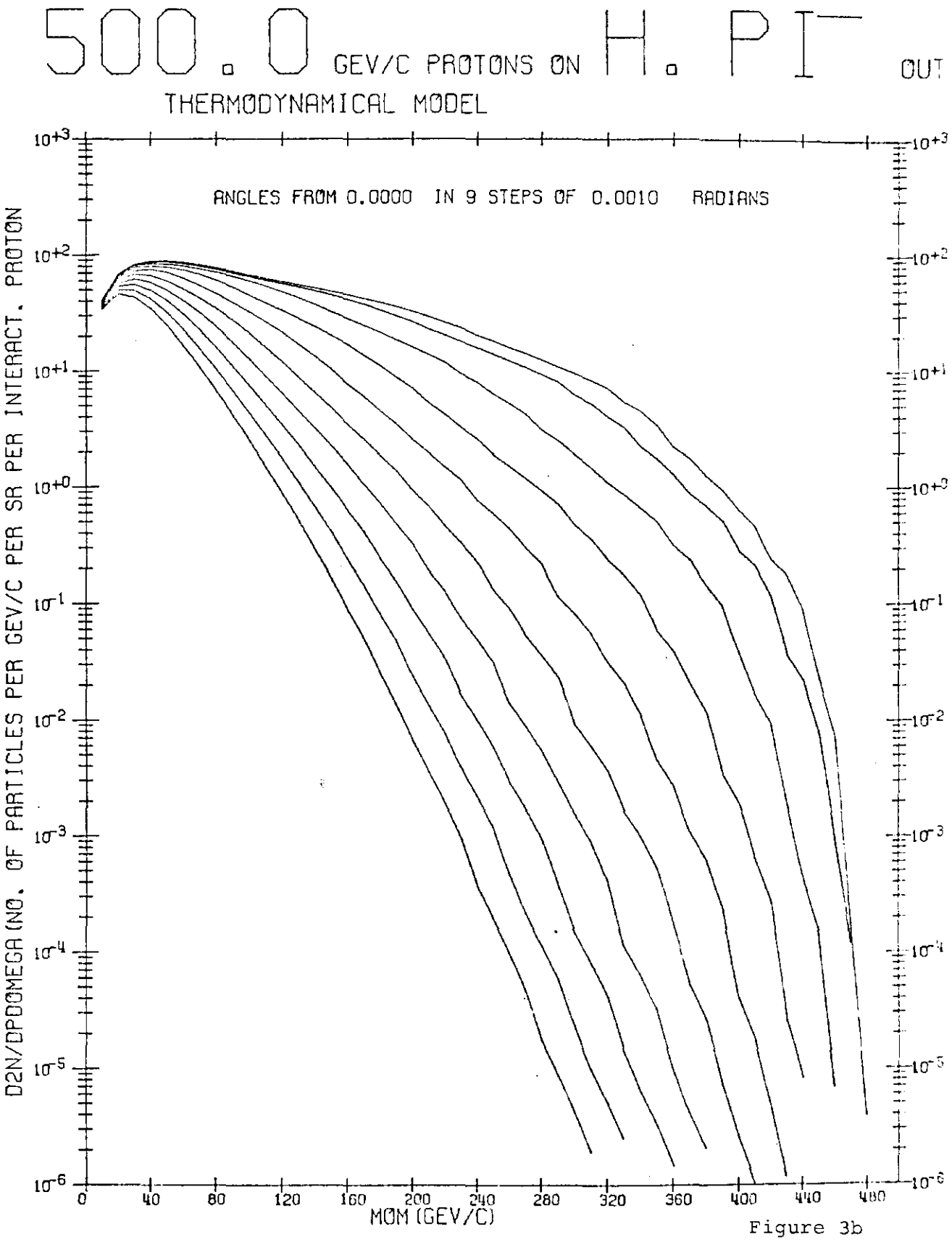

Figure 3b

2.70740 5.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000

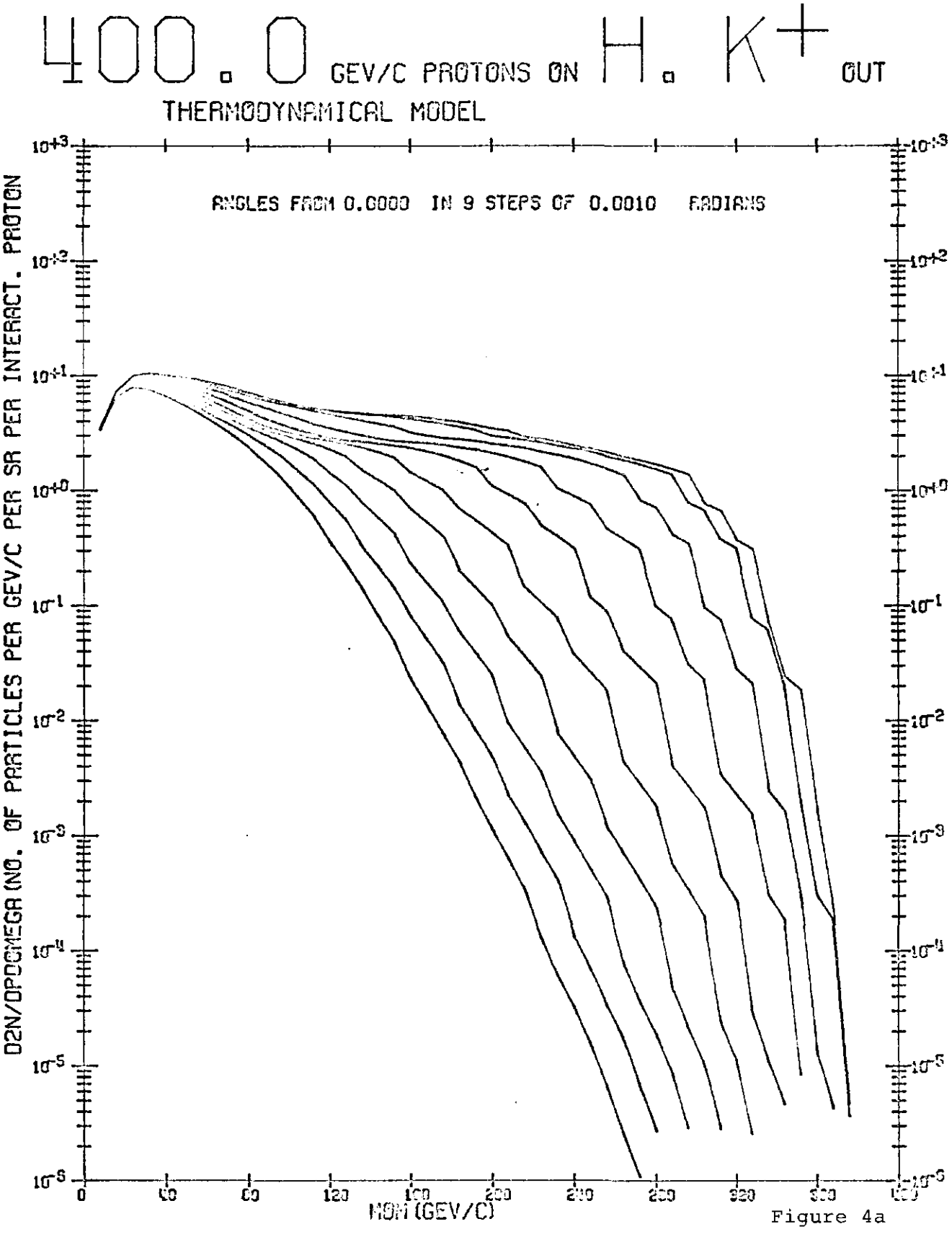

Figure 4a

2.78700 5.29300 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000

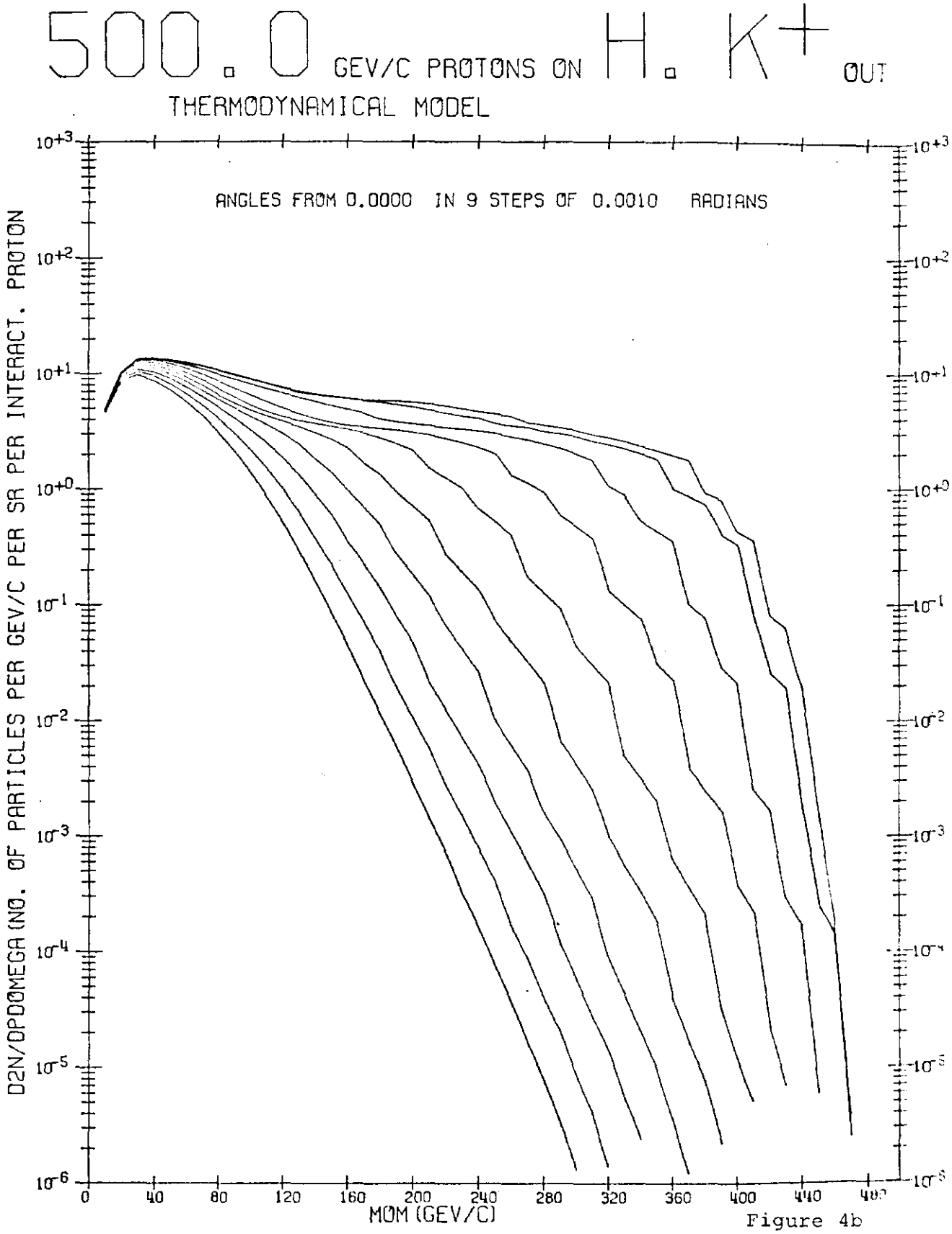

Figure 4b

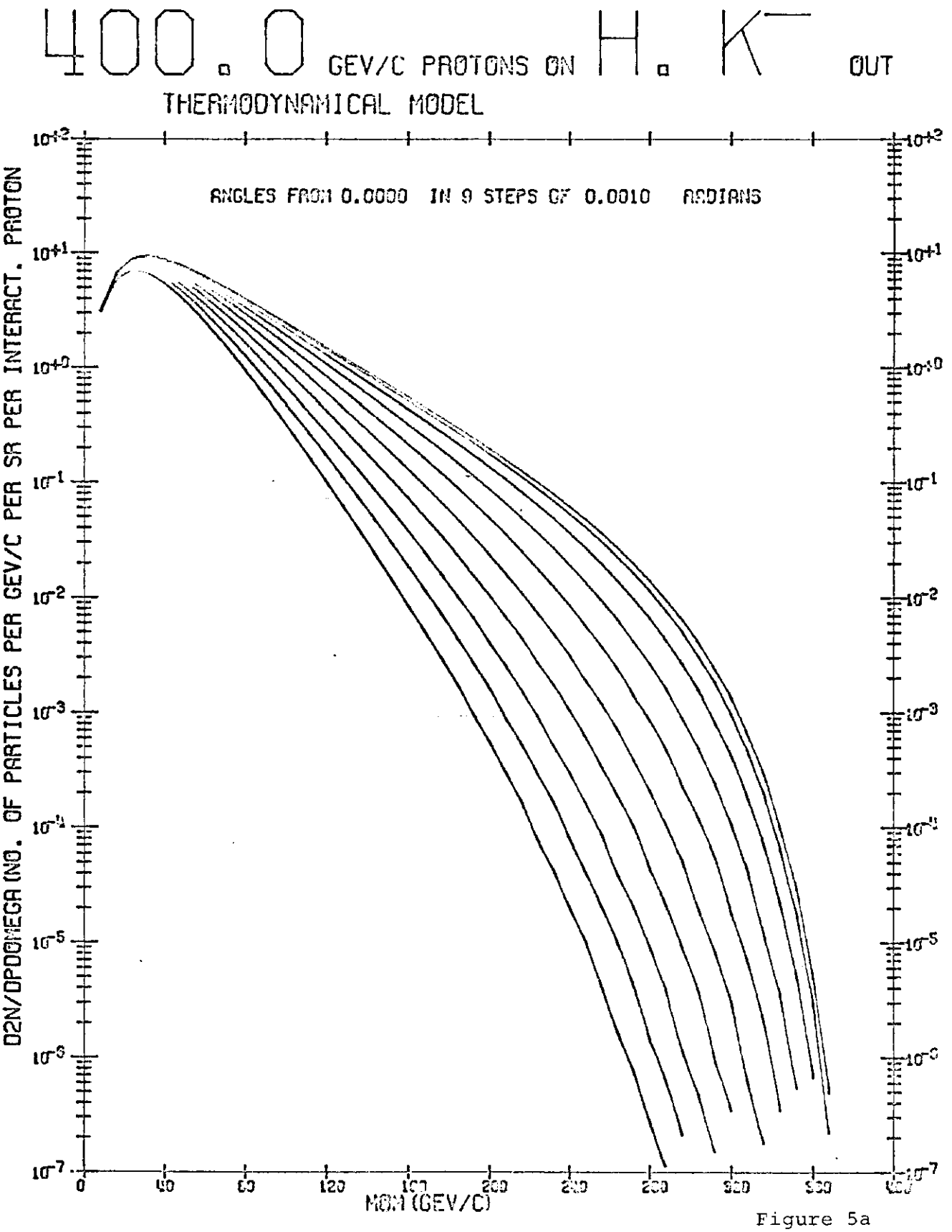
400.0 GEV/C PROTONS ON H. K⁻ OUT
THERMODYNAMICAL MODEL
ANGLES FROM 0.0000 IN 9 STEPS OF 0.0010 RADIANS
D2N/DPDOMEGA (NO. OF PARTICLES PER GEV/C PER SR PER INTERACT. PROTON
MOM (GEV/C)

Figure 5a

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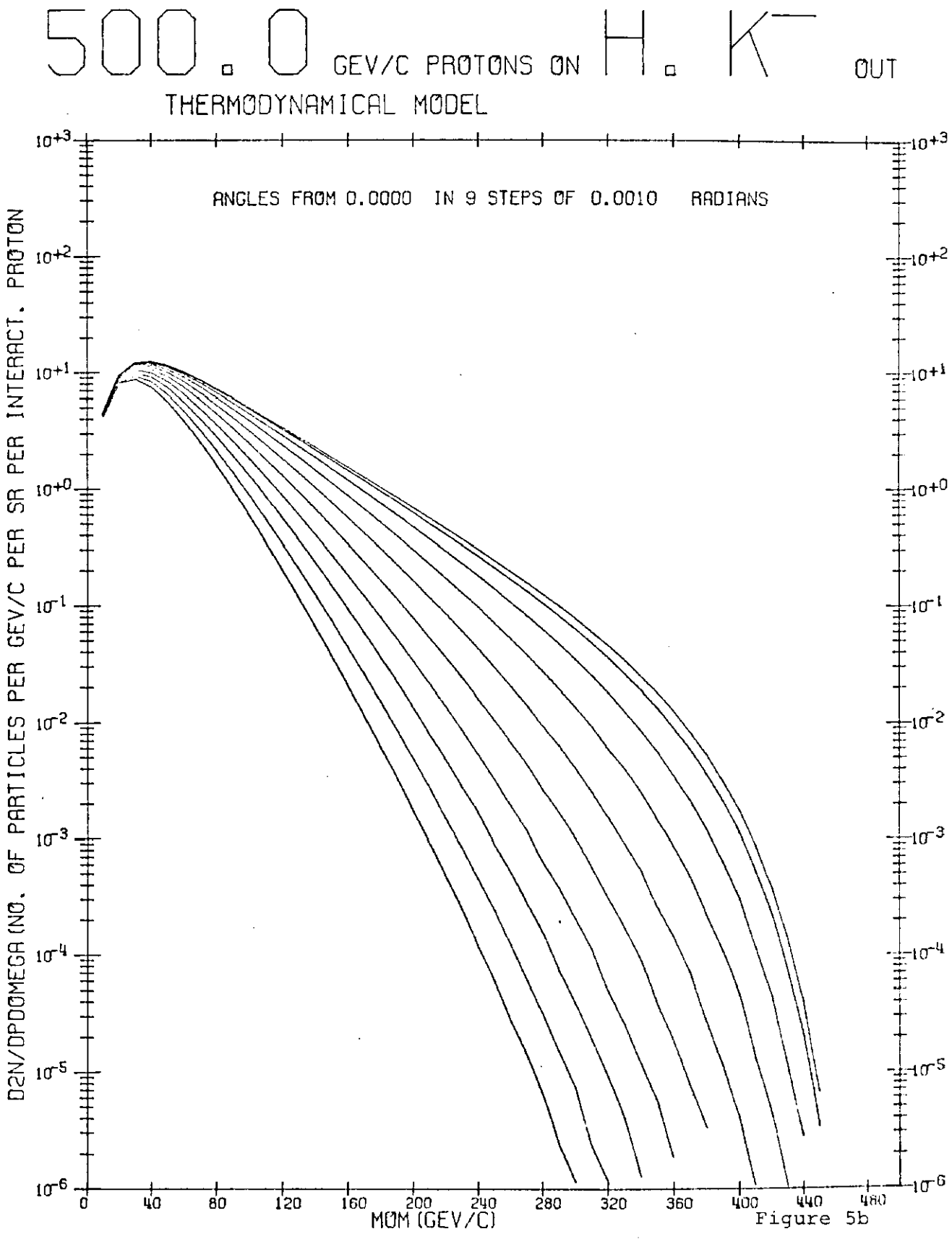
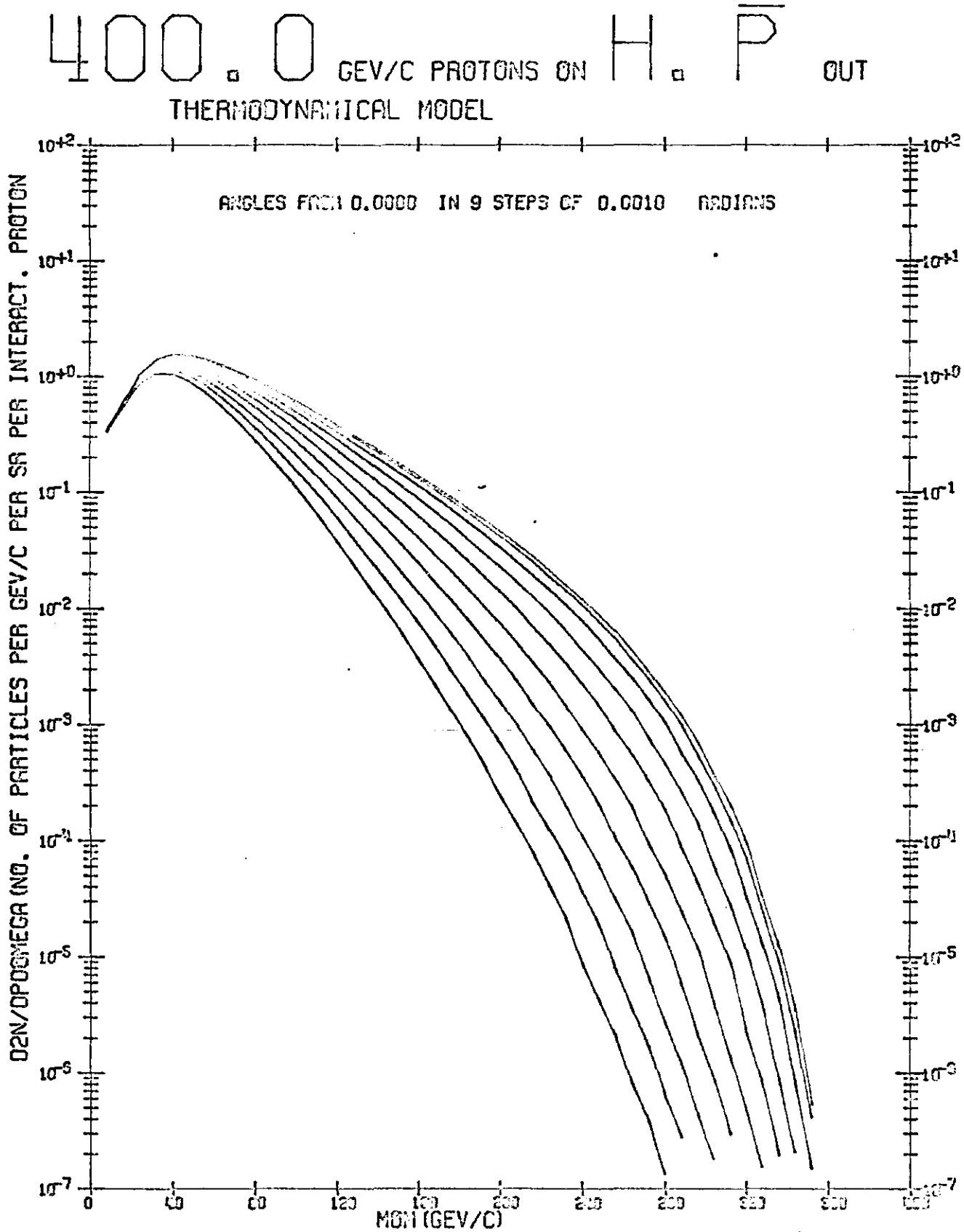


Figure 5b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THERMODYNAMICAL MODEL
ANGLES FROM 0.0000 IN 9 STEPS OF 0.0010 RADIANS
D2N/DPDOMEGA (NO. OF PARTICLES PER GEV/C PER SR PER INTERACT. PROTON
MOM (GEV/C)

Figure 6a

0.00000 0.00000 6.35200 0.50000 5.13050 0.00000 0.54230 0.00000 0.00000 0.00000

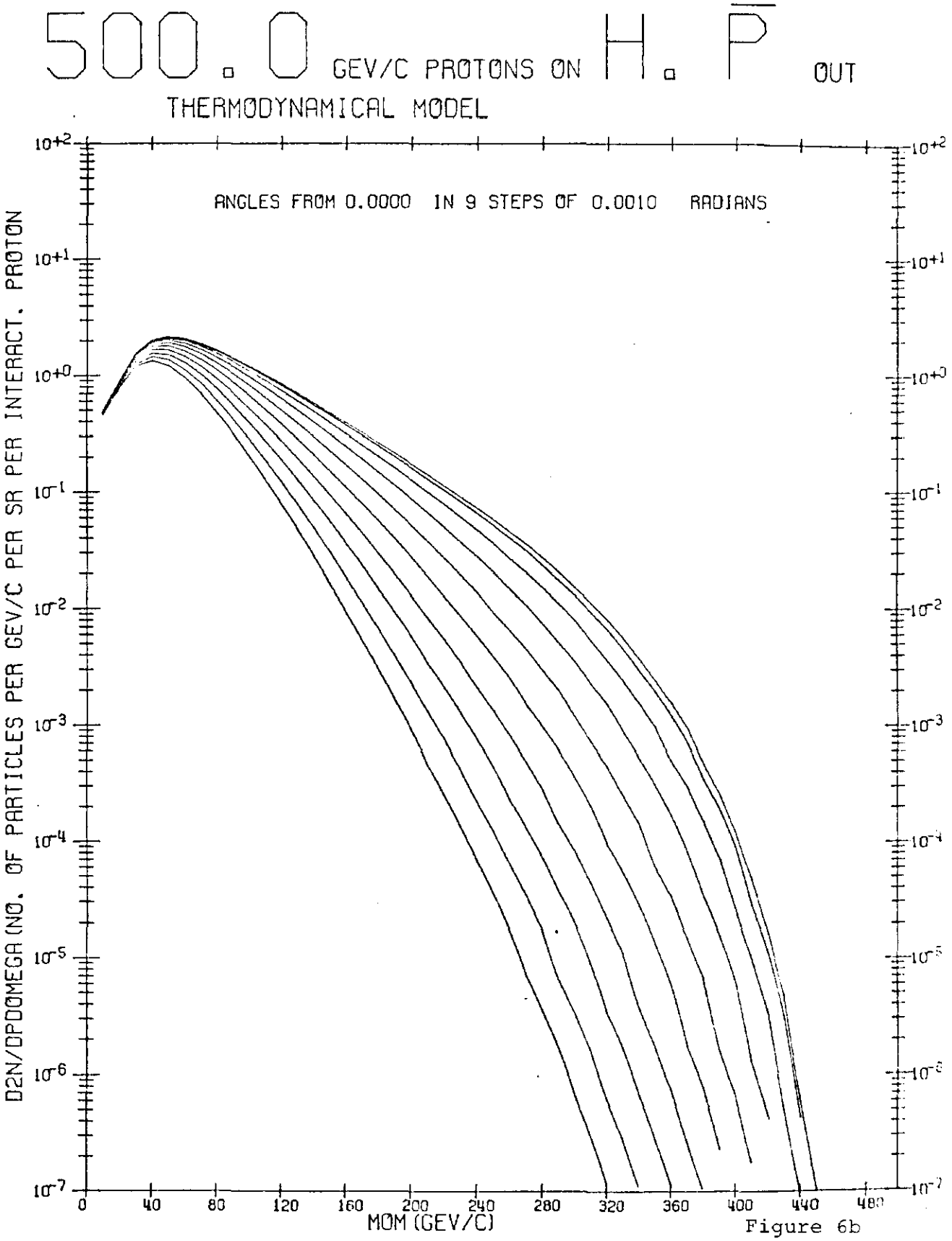


Figure 6b

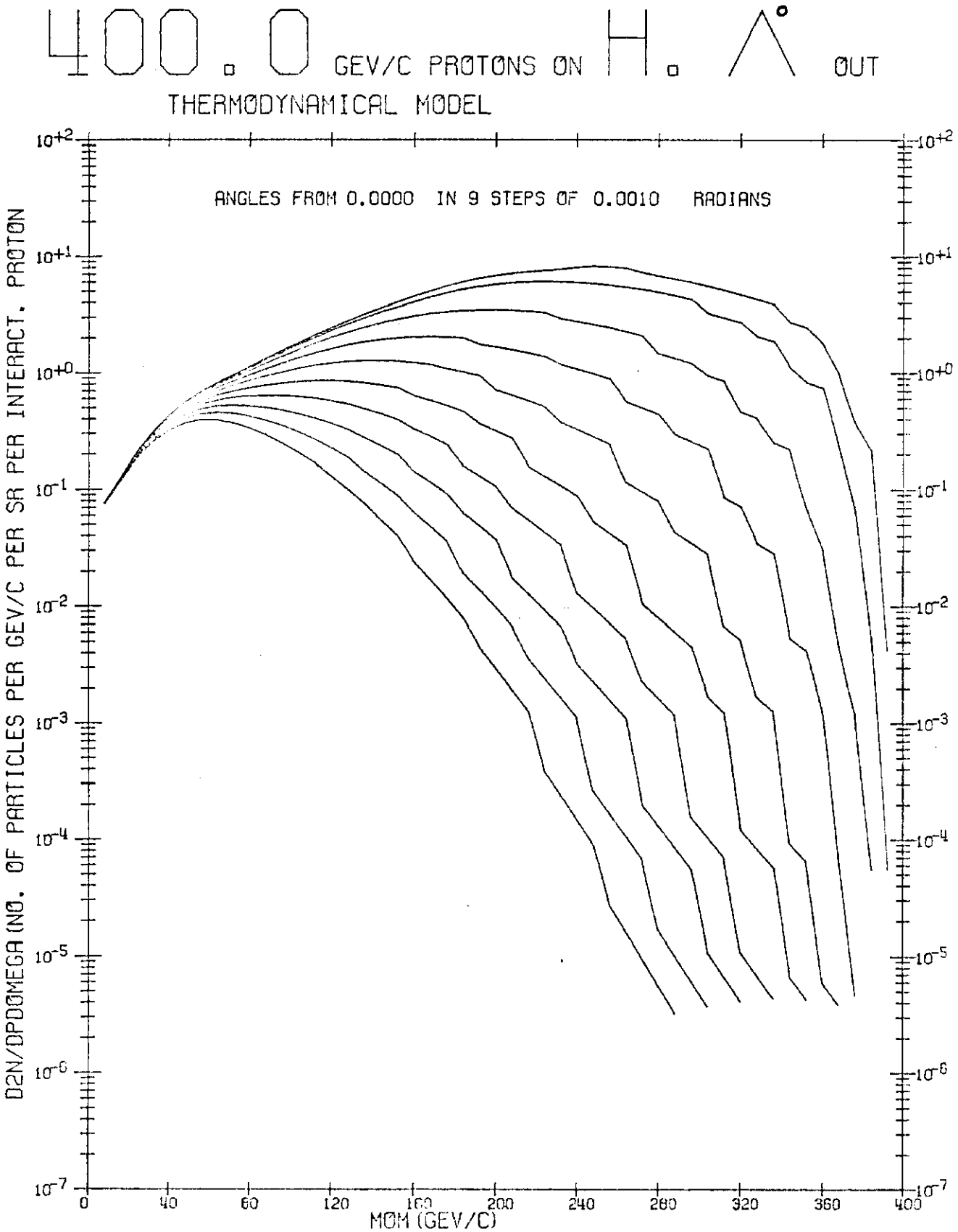
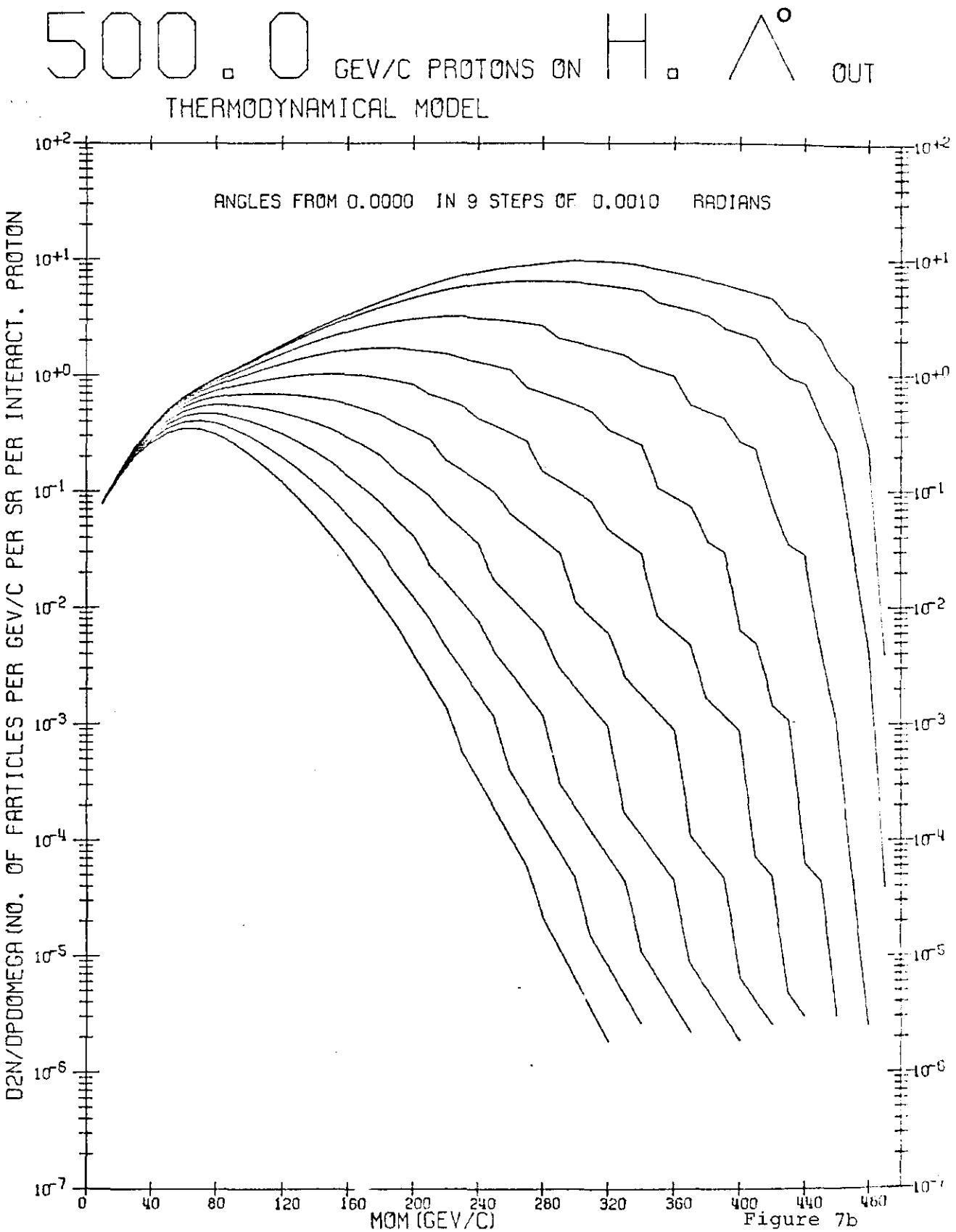

400.0 GEV/C PROTONS ON H. A° OUT
THERMODYNAMICAL MODEL
ANGLES FROM 0.0000 IN 9 STEPS OF 0.0010 RADIANS
D2N/DPDOMEGA (NO. OF PARTICLES PER GEV/C PER SR PER INTERACT. PROTON)
MOM (GEV/C)
0
40
80
120
160
200
240
280
320
360
400
10^{+2}
10^{+1}
10^{+0}
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{-5}
10^{-6}
10^{-7}

Figure 7a


500.0 GEV/C PROTONS ON H. Λ° OUT
THERMODYNAMICAL MODEL
ANGLES FROM 0.0000 IN 9 STEPS OF 0.0010 RADIANS
D2N/DPDOMEGA (NO. OF PARTICLES PER GEV/C PER SR PER INTERACT. PROTON
MOM (GEV/C)
0
40
80
120
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200
240
280
320
360
400
440
480
10^{+2}
10^{+1}
10^{+0}
10^{-1}
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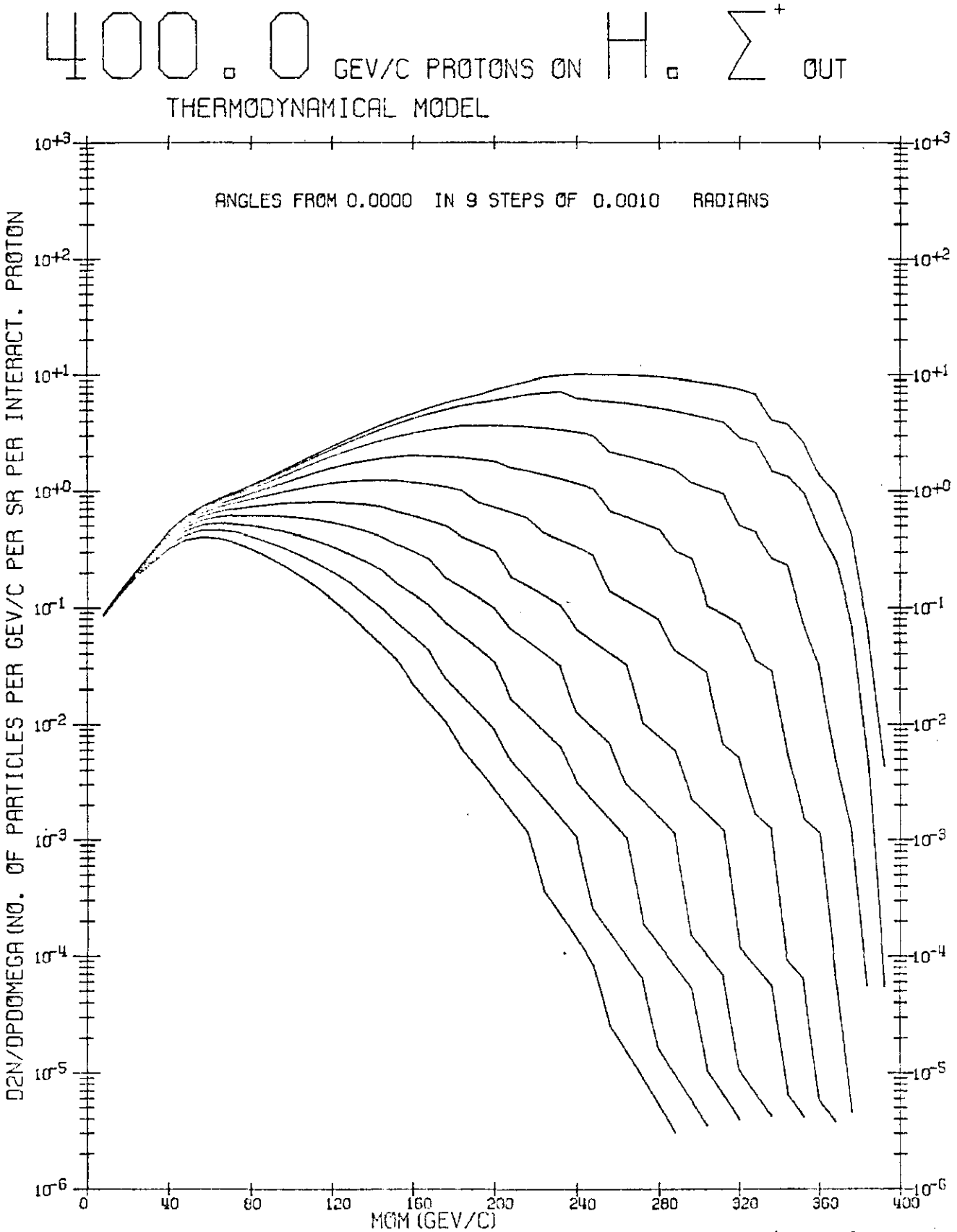
10^{-6}
10^{-7}

Figure 7b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THERMODYNAMICAL MODEL
ANGLES FROM 0.0000 IN 9 STEPS OF 0.0010 RADIANS
D2N/DPDOMEGA(NO. OF PARTICLES PER GEV/C PER SR PER INTERACT. PROTON
MOM (GEV/C)
0
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360
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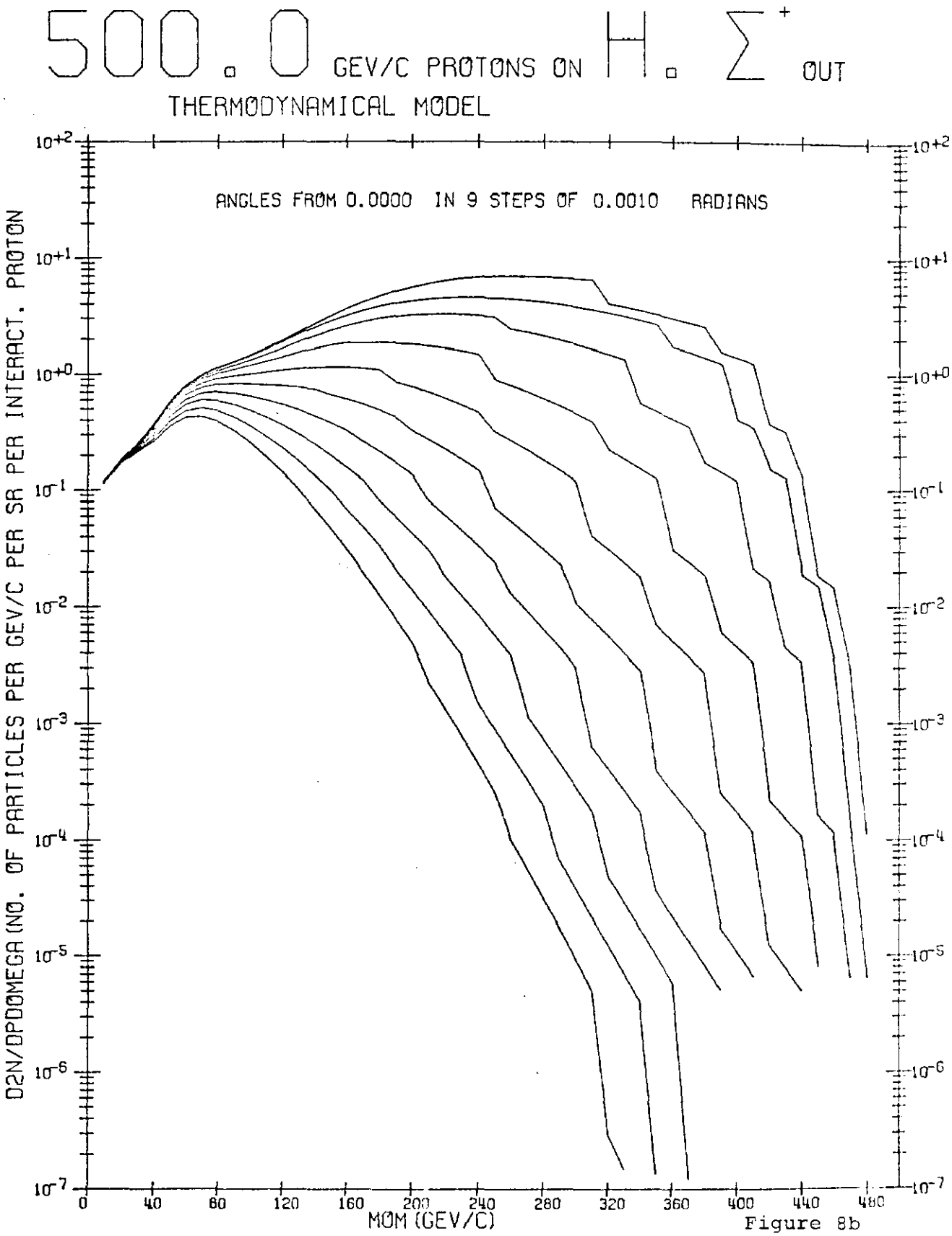
10+3
10+2
10+1
10+0
10-1
10-2
10-3
10-4
10-5
10-6

Figure 8a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THERMODYNAMICAL MODEL
ANGLES FROM 0.0000 IN 9 STEPS OF 0.0010 RADIANS
D2N/DPDOMEGA(NO. OF PARTICLES PER GEV/C PER SR PER INTERACT. PROTON
MOM (GEV/C)
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280
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10+2
10+1
10+0
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10-3
10-4
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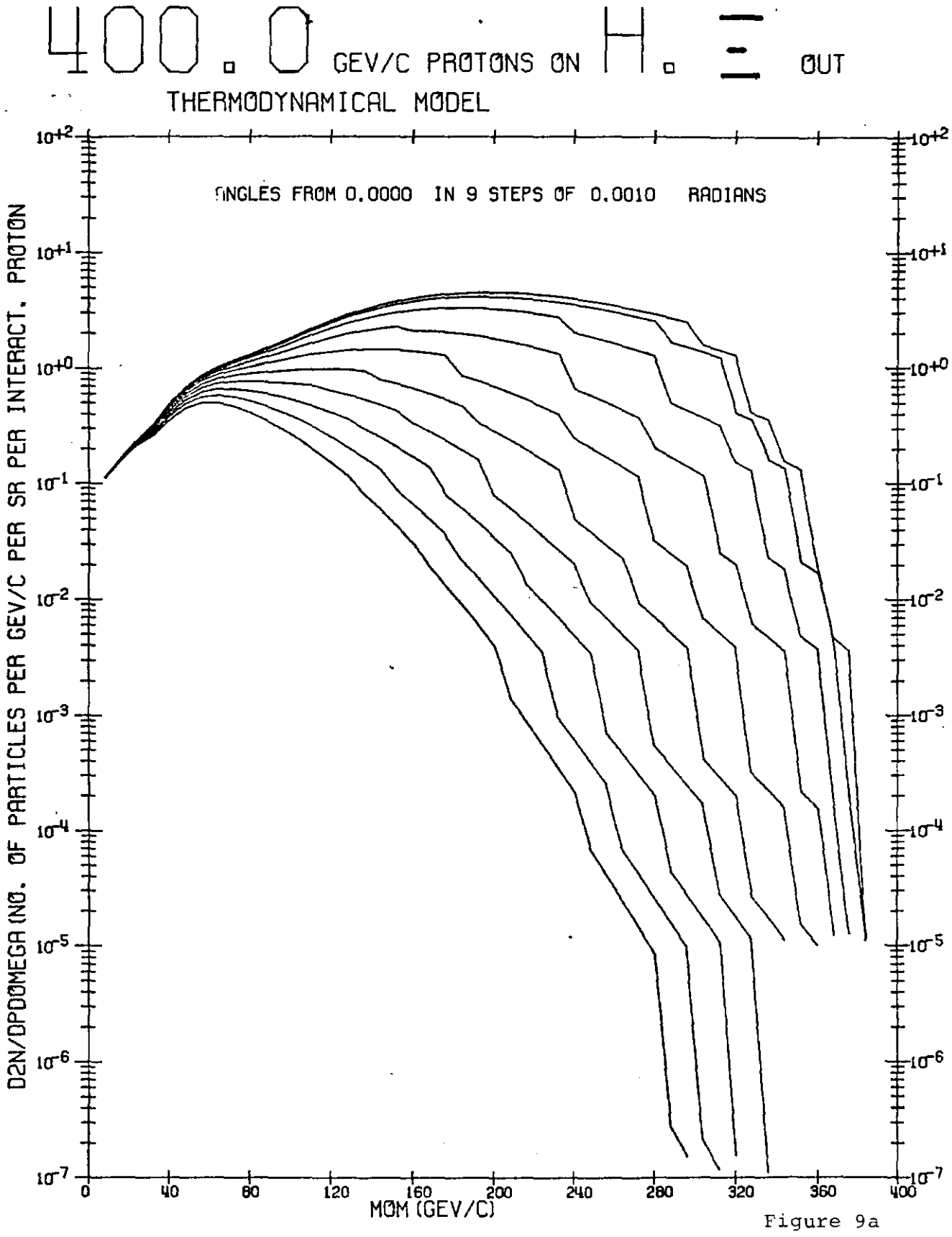
10-7

Figure 8b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THERMODYNAMICAL MODEL
ANGLES FROM 0.0000 IN 9 STEPS OF 0.0010 RADIANS
D2N/DPDOMEGA (NO. OF PARTICLES PER GEV/C PER SR PER INTERACT. PROTON
MOM (GEV/C)
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280
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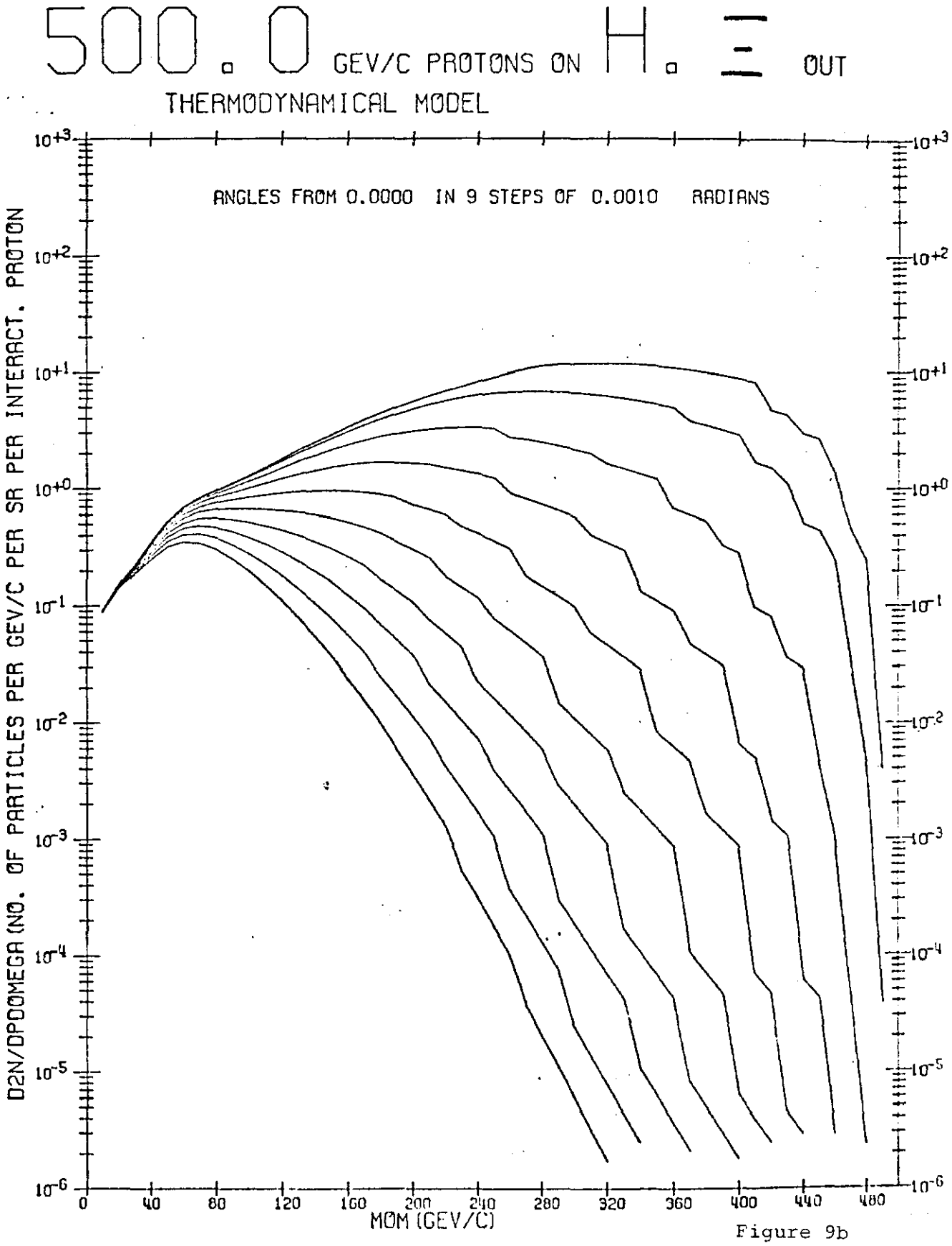
Figure 9a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THERMODYNAMICAL MODEL
ANGLES FROM 0.0000 IN 9 STEPS OF 0.0010 RADIANS
D2N/DPDOMEGA (NO. OF PARTICLES PER GEV/C PER SR PER INTERACT. PROTON
MOM (GEV/C)
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240
280
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360
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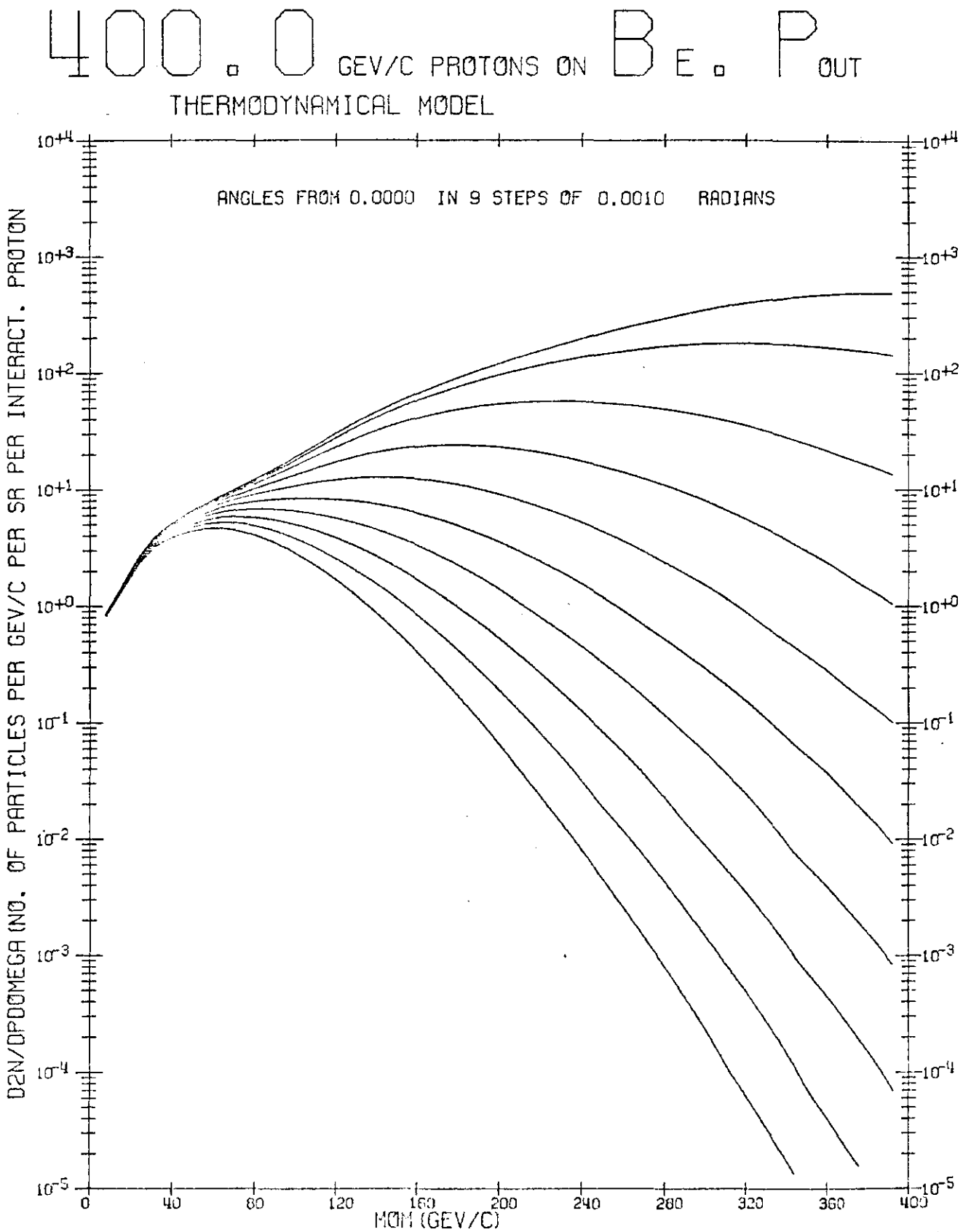
440
480
10+3
10+2
10+1
10+0
10-1
10-2
10-3
10-4
10-5
10-6

Figure 9b


400.0 GEV/C PROTONS ON BE. P OUT
THERMODYNAMICAL MODEL
ANGLES FROM 0.0000 IN 9 STEPS OF 0.0010 RADIANS
D2N/DPDOMEGA (NO. OF PARTICLES PER GEV/C PER SR PER INTERACT. PROTON
MOM (GEV/C)
0
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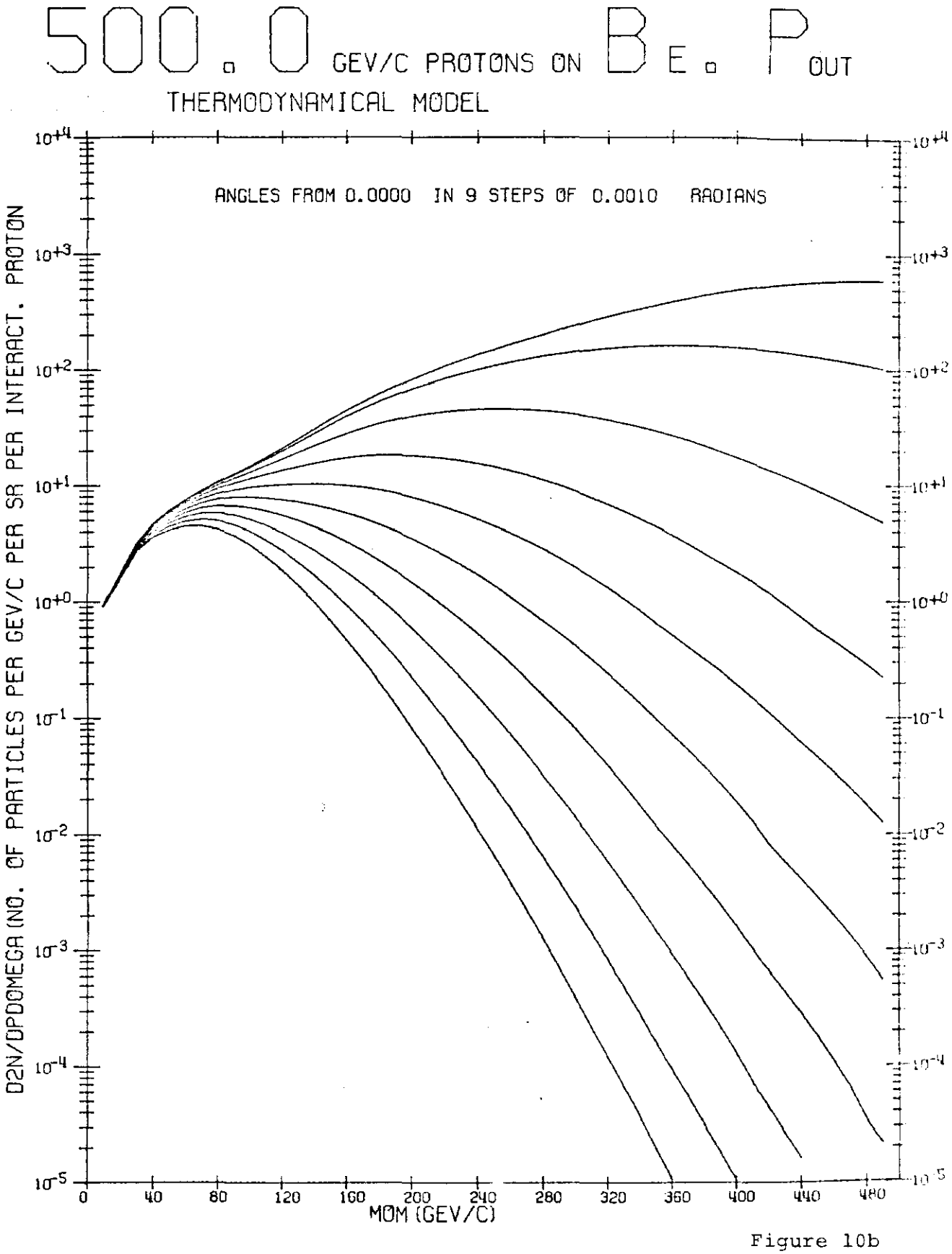
120
160
200
240
280
320
360
400
10+4
10+3
10+2
10+1
10+0
10-1
10-2
10-3
10-4
10-5

Figure 10a


500.0 GEV/C PROTONS ON BE. P OUT
THERMODYNAMICAL MODEL
ANGLES FROM 0.0000 IN 9 STEPS OF 0.0010 RADIANS
D2N/DPDOMEGA (NO. OF PARTICLES PER GEV/C PER SR PER INTERACT. PROTON
MOM (GEV/C)
0
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80
120
160
200
240
280
320
360
400
440
480
10^{+4}
10^{+3}
10^{+2}
10^{+1}
10^{+0}
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{-5}

Figure 10b

1.04100 3.17800 5.25500 0.00000 16.00000 3.51300 0.82040 0.00000 0.00000 0.00000

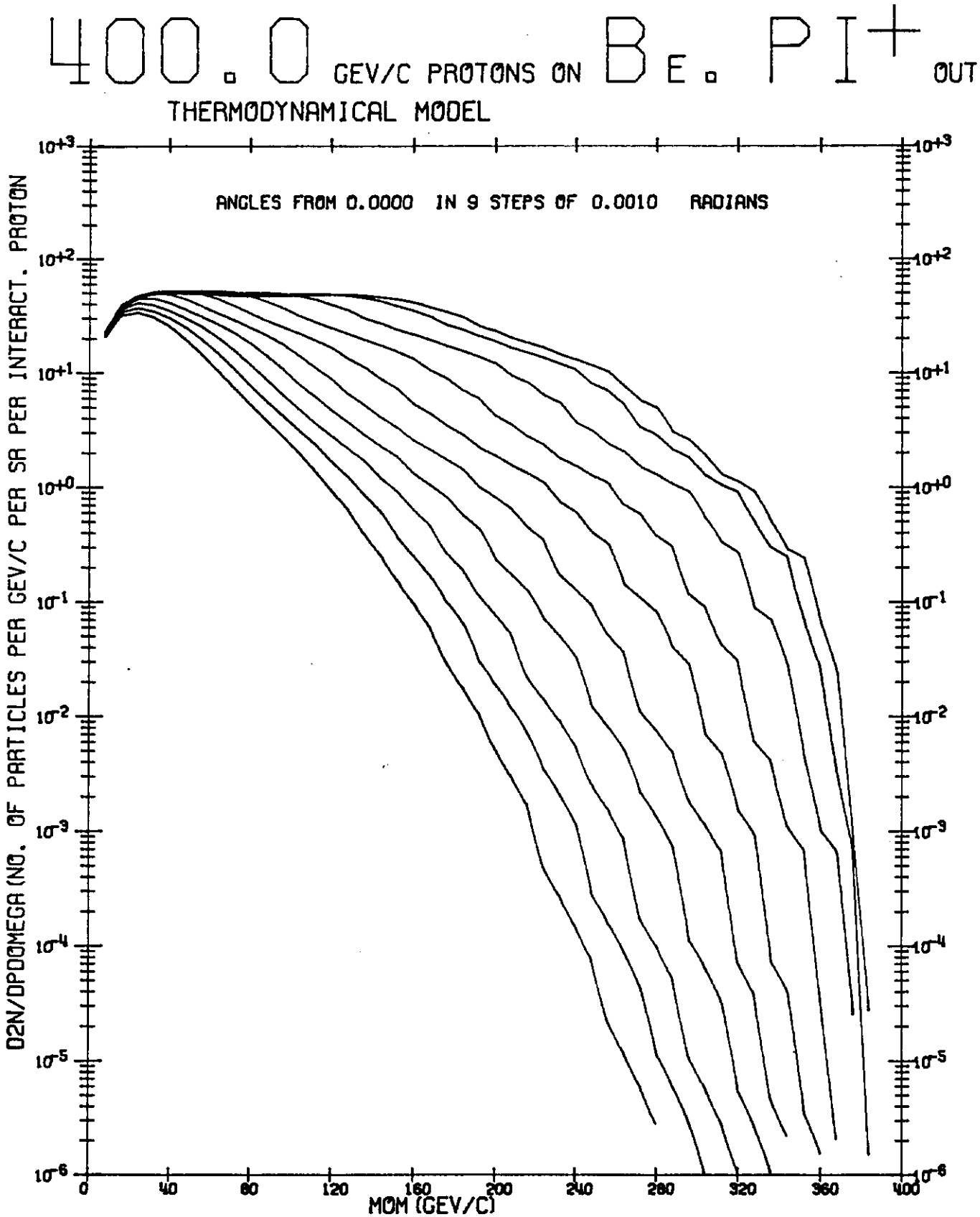

Figure 11a

1.84100 3.17600 5.25500 0.00000 16.09998 3.51300 0.62040 0.00000 0.00000 0.00000

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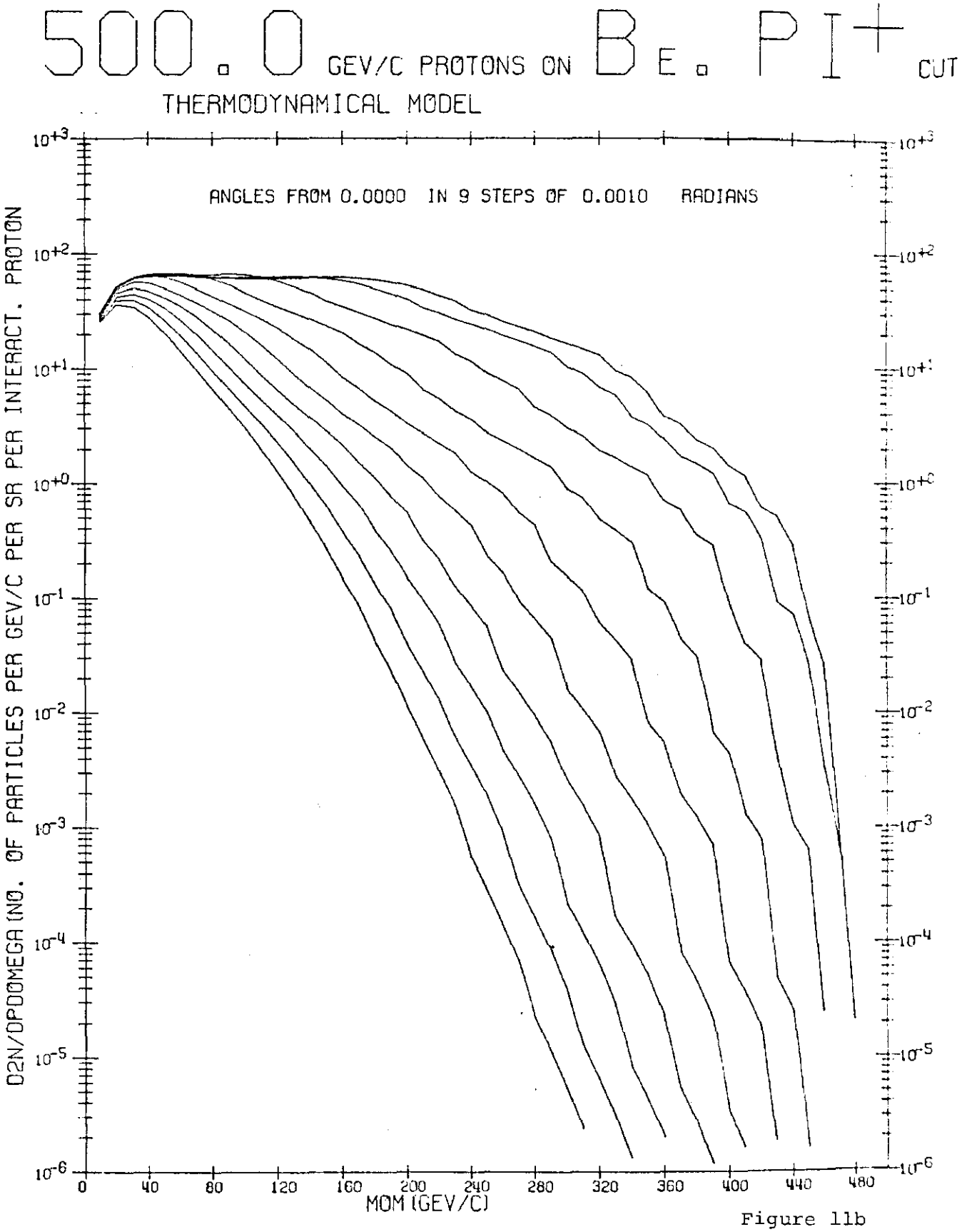

Figure 11b

2.27360 0.50000 0.00000 0.00000 4.00073 0.57150 0.40400 0.00000 0.00000 0.00000

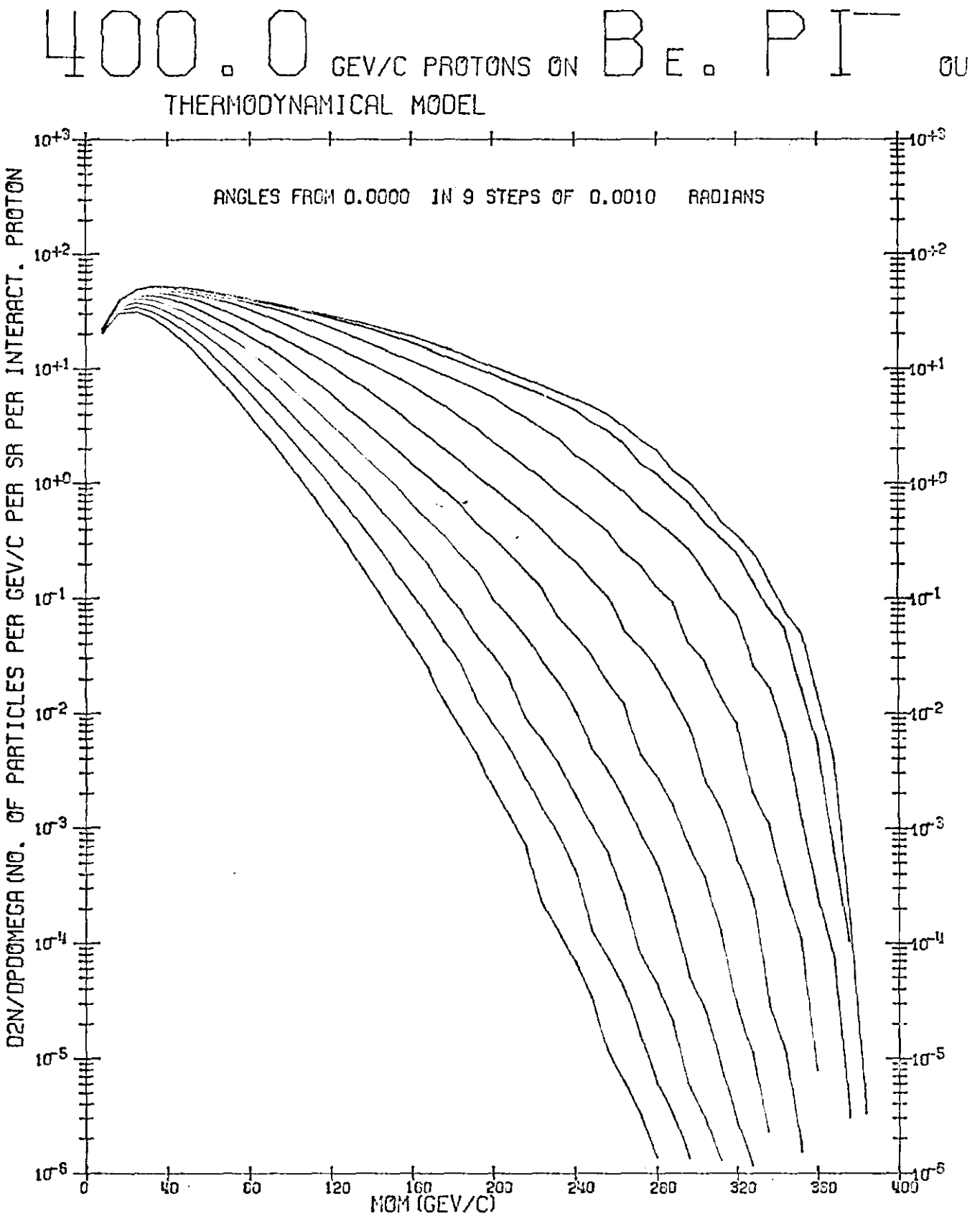

Figure 12a

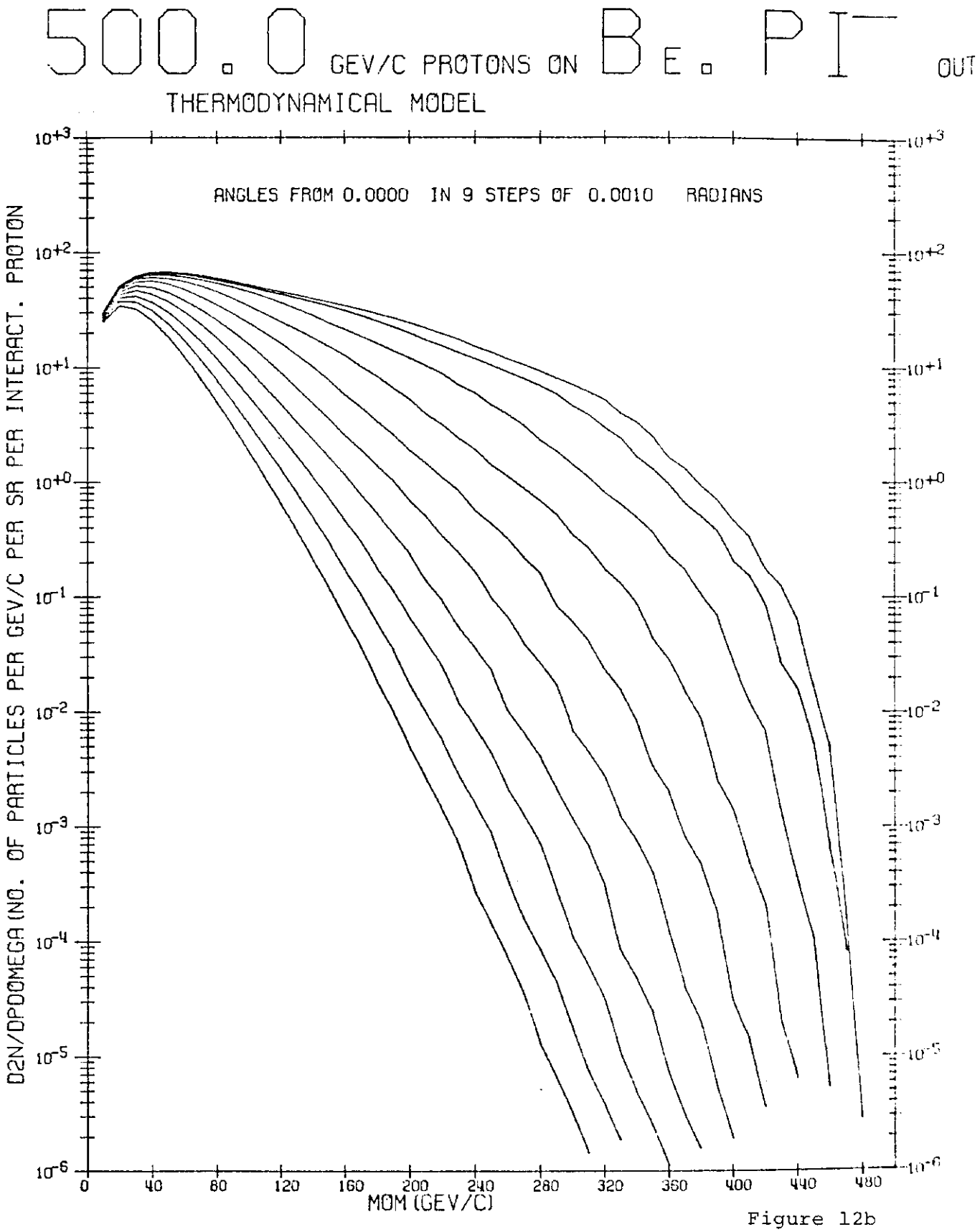
500.0 GEV/C PROTONS ON BE. PI- OUT
THERMODYNAMICAL MODEL
ANGLES FROM 0.0000 IN 9 STEPS OF 0.0010 RADIANS
D2N/DPDOMEGA (NO. OF PARTICLES PER GEV/C PER SR PER INTERACT. PROTON
MOM (GEV/C)
0
40
80
120
160
200
240
280
320
360
400
440
480
10^{+3}
10^{+2}
10^{+1}
10^{+0}
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{-5}
10^{-6}

Figure 12b

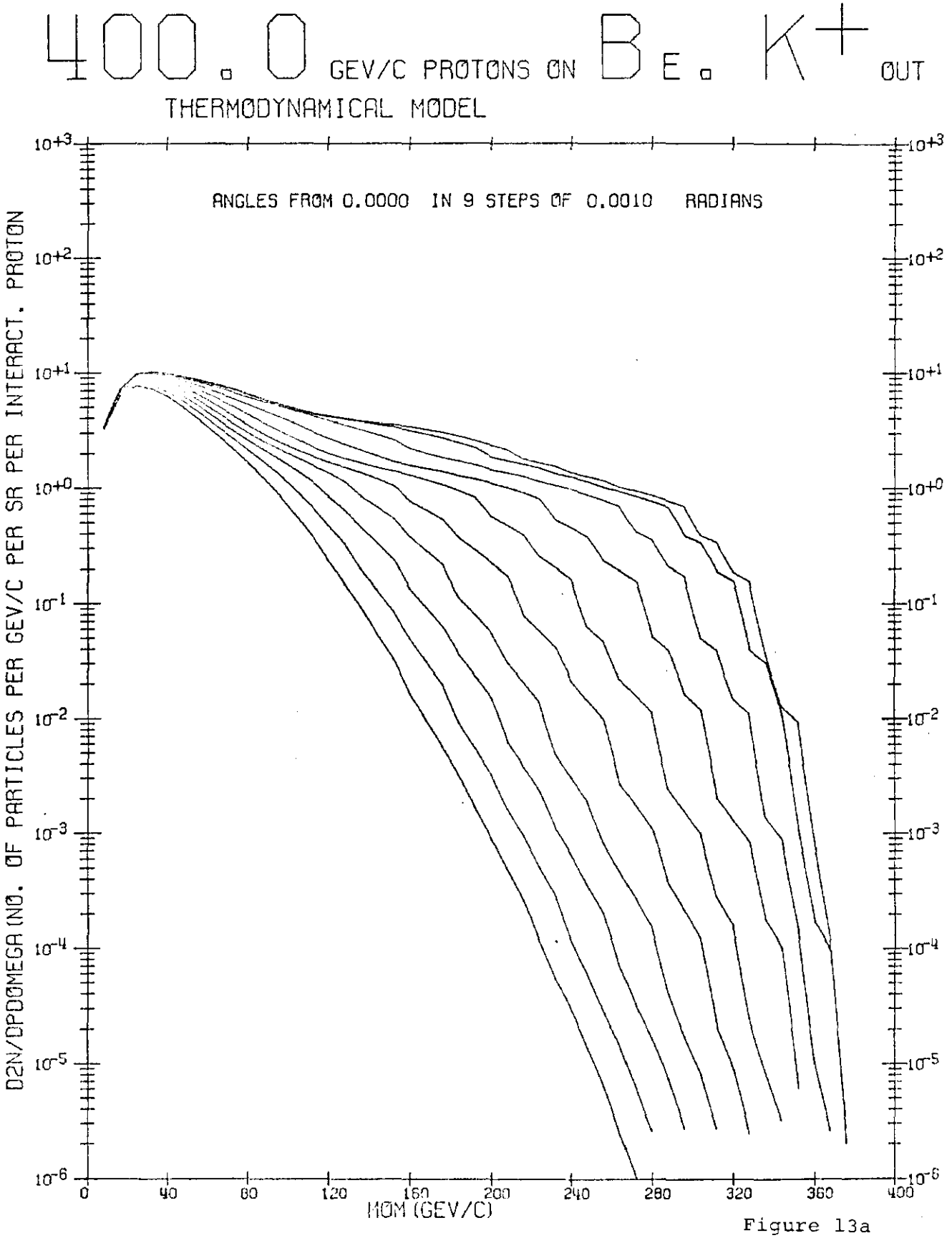
400.0 GEV/C PROTONS ON BE. K+ OUT
THERMODYNAMICAL MODEL
ANGLES FROM 0.0000 IN 9 STEPS OF 0.0010 RADIANS
D2N/DPDOMEGA(NO. OF PARTICLES PER GEV/C PER SR PER INTERACT. PROTON
MOM (GEV/C)
10+3
10+2
10+1
10+0
10-1
10-2
10-3
10-4
10-5
10-6
0
40
80
120
160
200
240
280
320
360
400

Figure 13a

2.73300 4.98100 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000

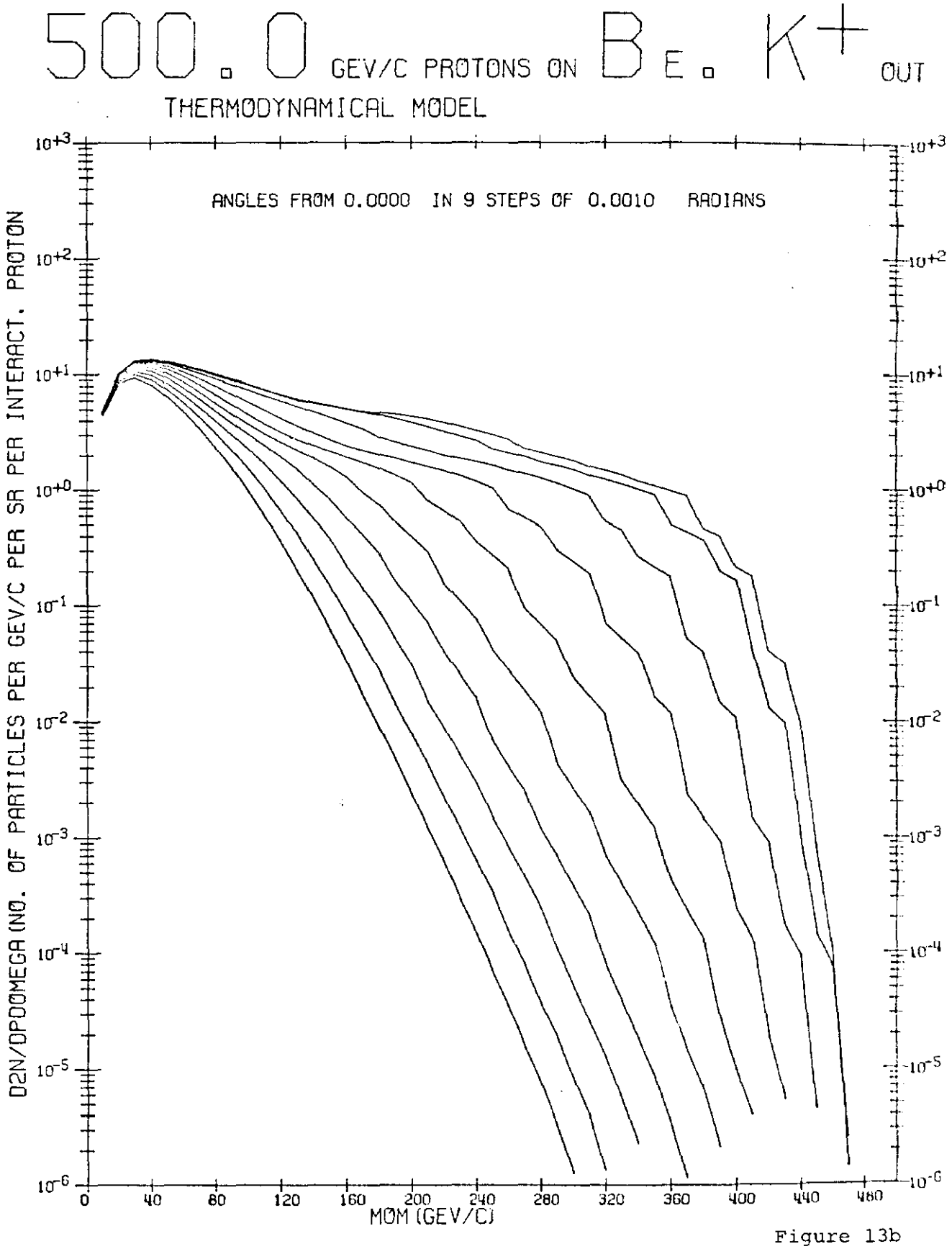

Figure 13b

0.00000 0.00000 5.41720 0.50000 4.66679 0.00000 0.48420 0.00000 0.00000 0.00000

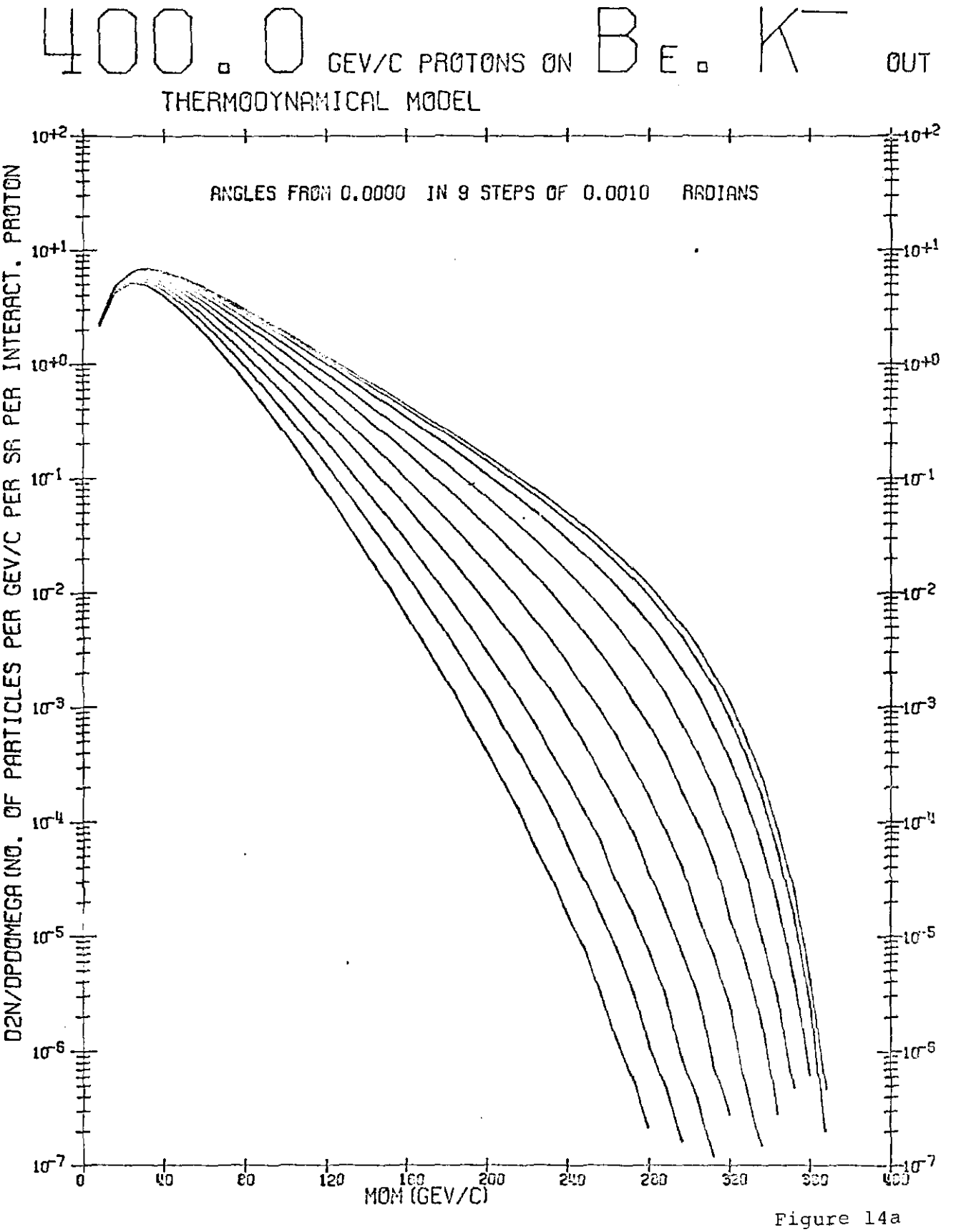

Figure 14a

0.00000 0.00000 5.41730 0.50000 4.86679 0.00000 0.48480 0.00000 0.00000 0.00000

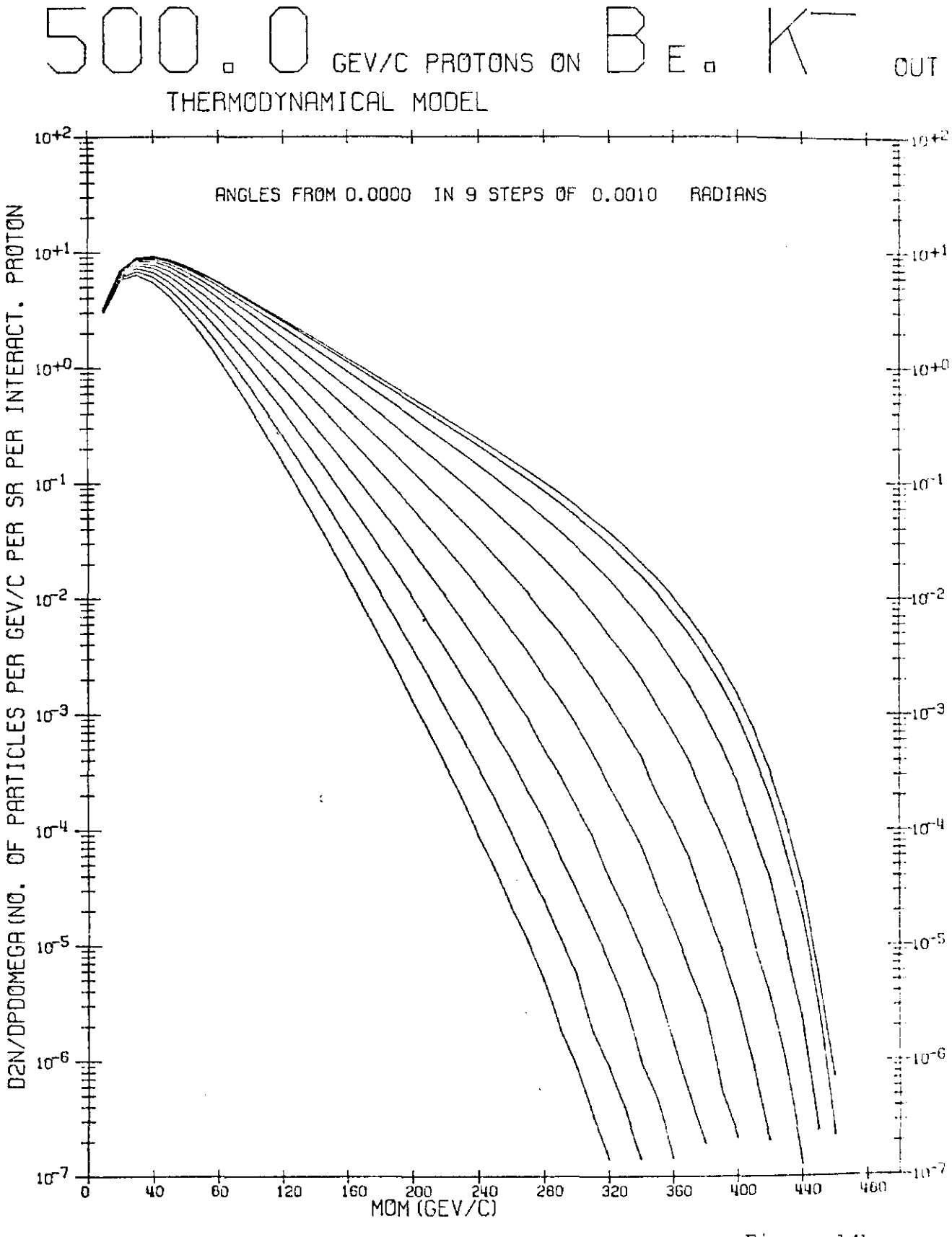

Figure 14b

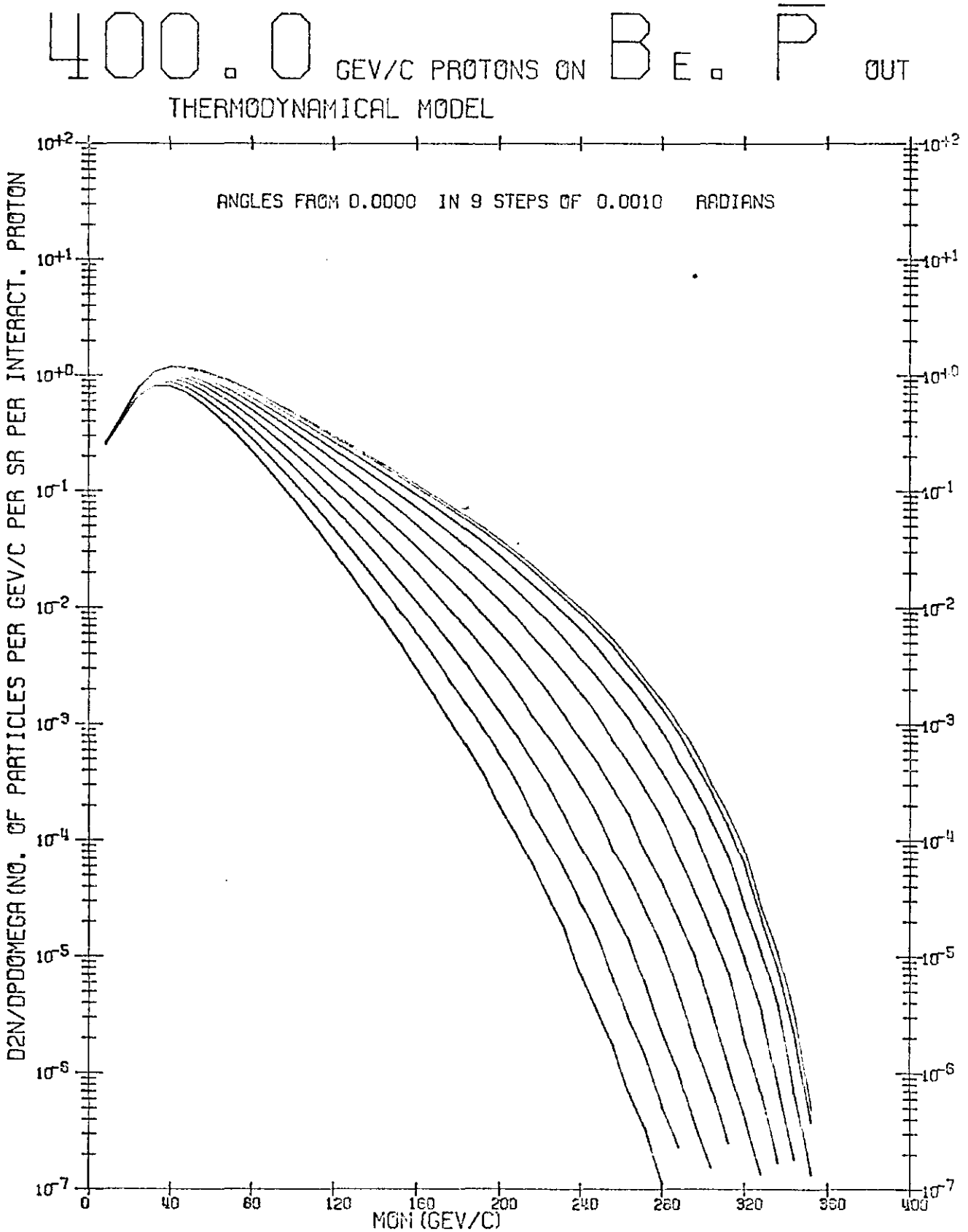
400.0 GEV/C PROTONS ON BE. P̄ OUT
THERMODYNAMICAL MODEL
ANGLES FROM 0.0000 IN 9 STEPS OF 0.0010 RADIANS
D2N/DPDOMEGA(NO. OF PARTICLES PER GEV/C PER SR PER INTERACT. PROTON
MOM (GEV/C)
0
40
80
120
160
200
240
280
320
360
400
10+2
10+1
10+0
10-1
10-2
10-3
10-4
10-5
10-6
10-7

Figure 15a

0.00000 0.00000 6.27489 0.50000 4.88879 0.00000 0.46460 0.00000 0.00000 0.00000

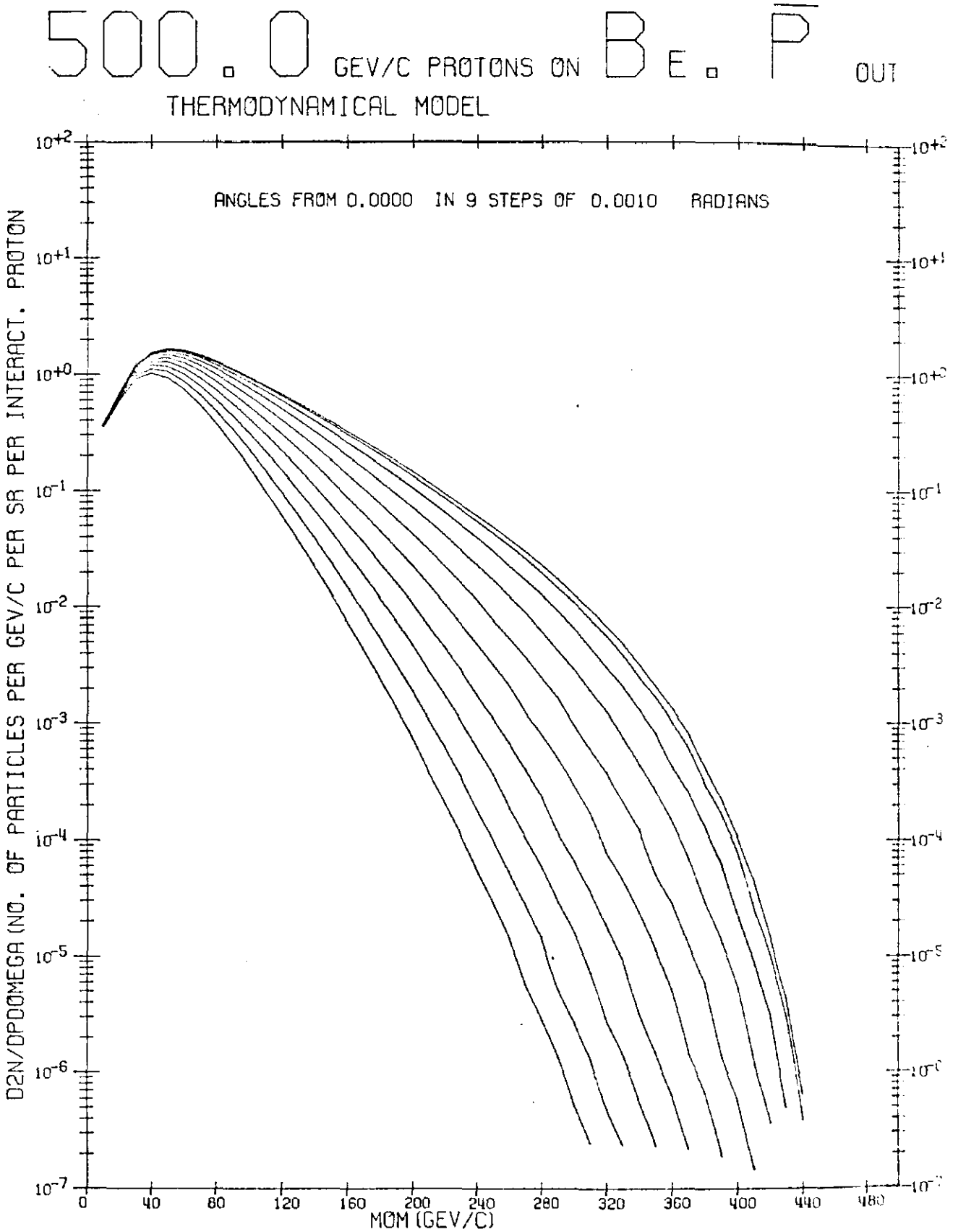

Figure 15b

1.41000 2.88300 4.80700 0.28200 15.65099 5.08200 0.72050 0.00000 0.00000 0.00000

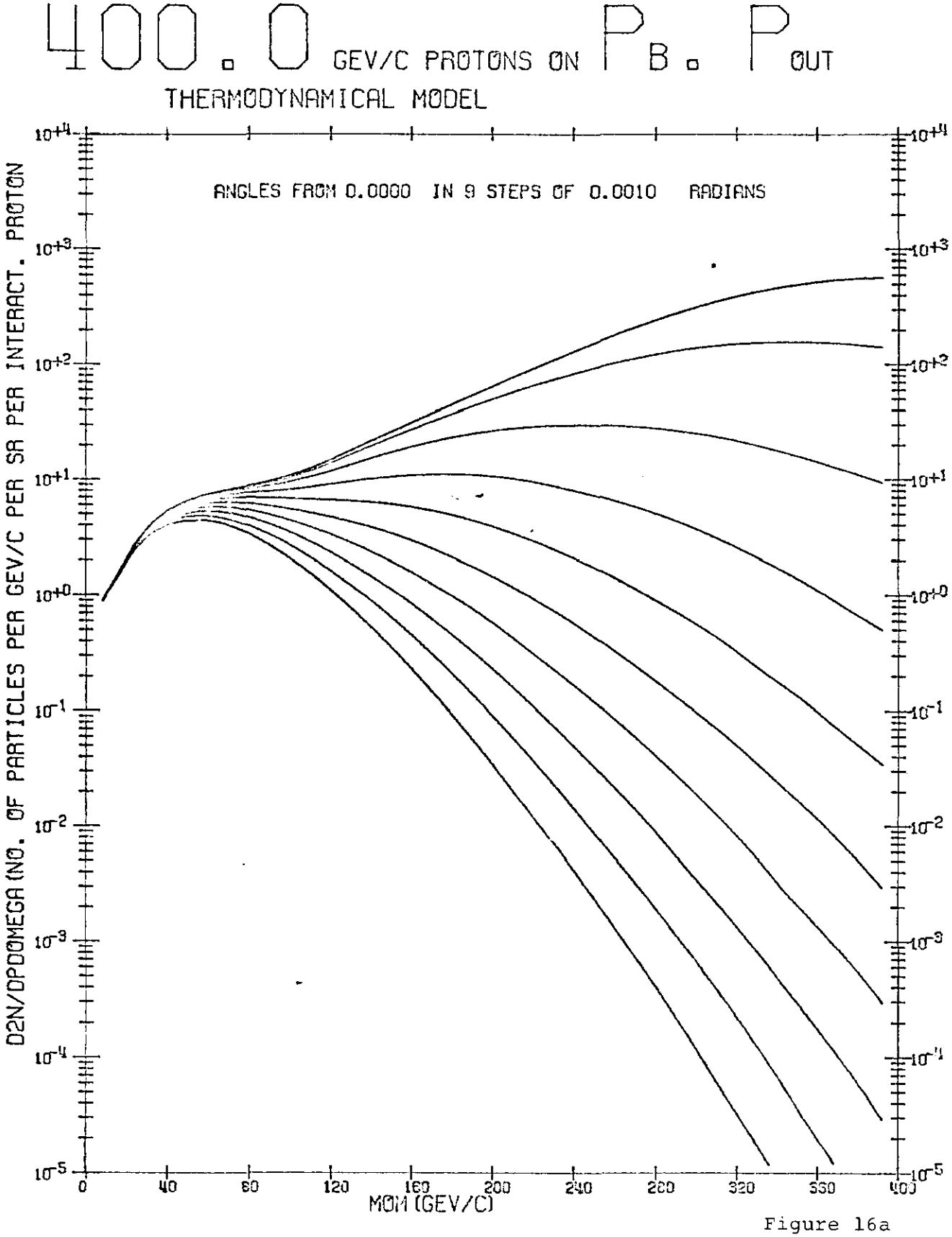

Figure 16a

1.41000 2.98600 4.80700 0.28200 15.65099 5.08200 0.76850 0.00000 0.00000 0.00000

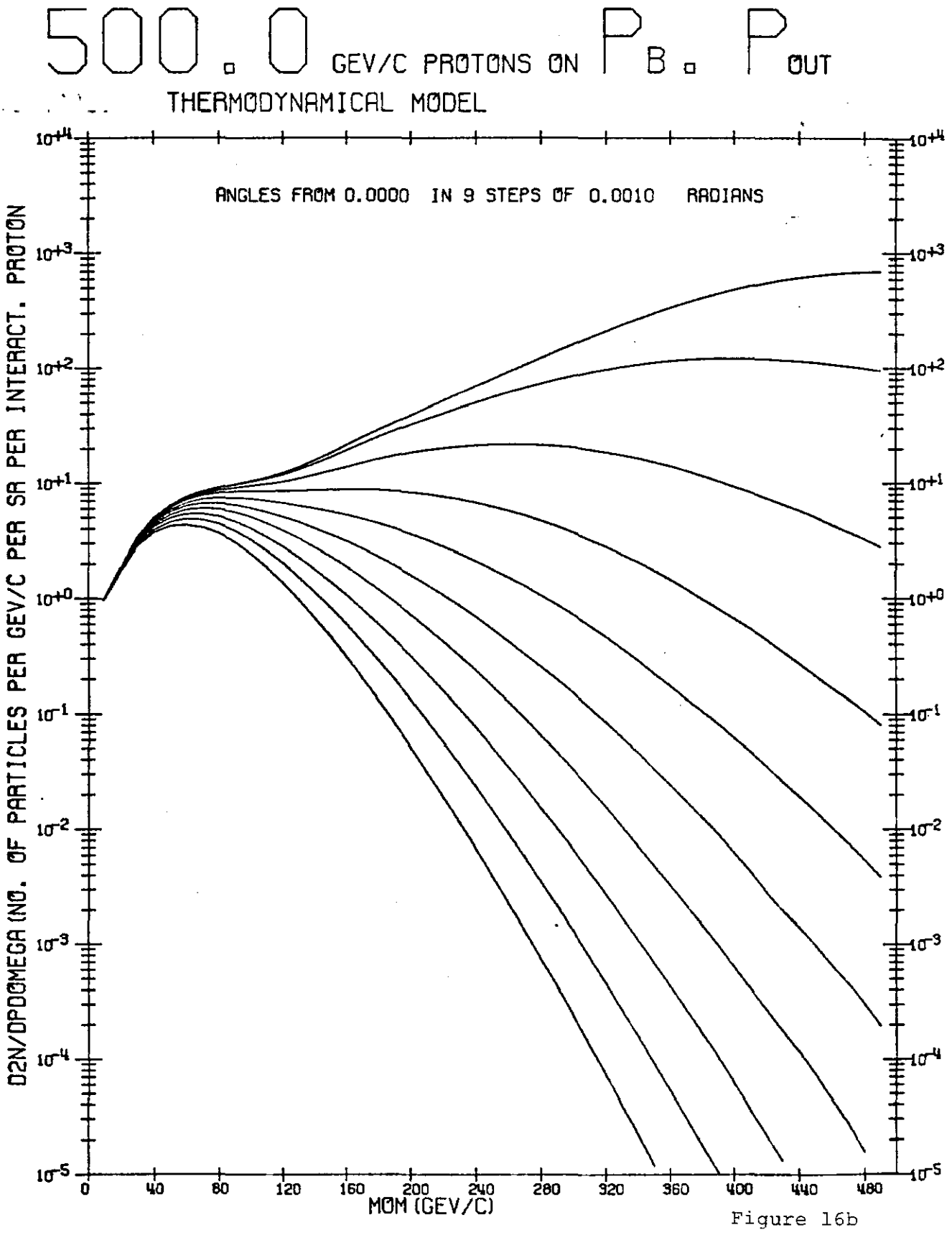

Figure 16b

1.41000 2.90000 4.80700 0.00000 15.05000 5.00200 0.70000 0.00000 0.00000 0.00000

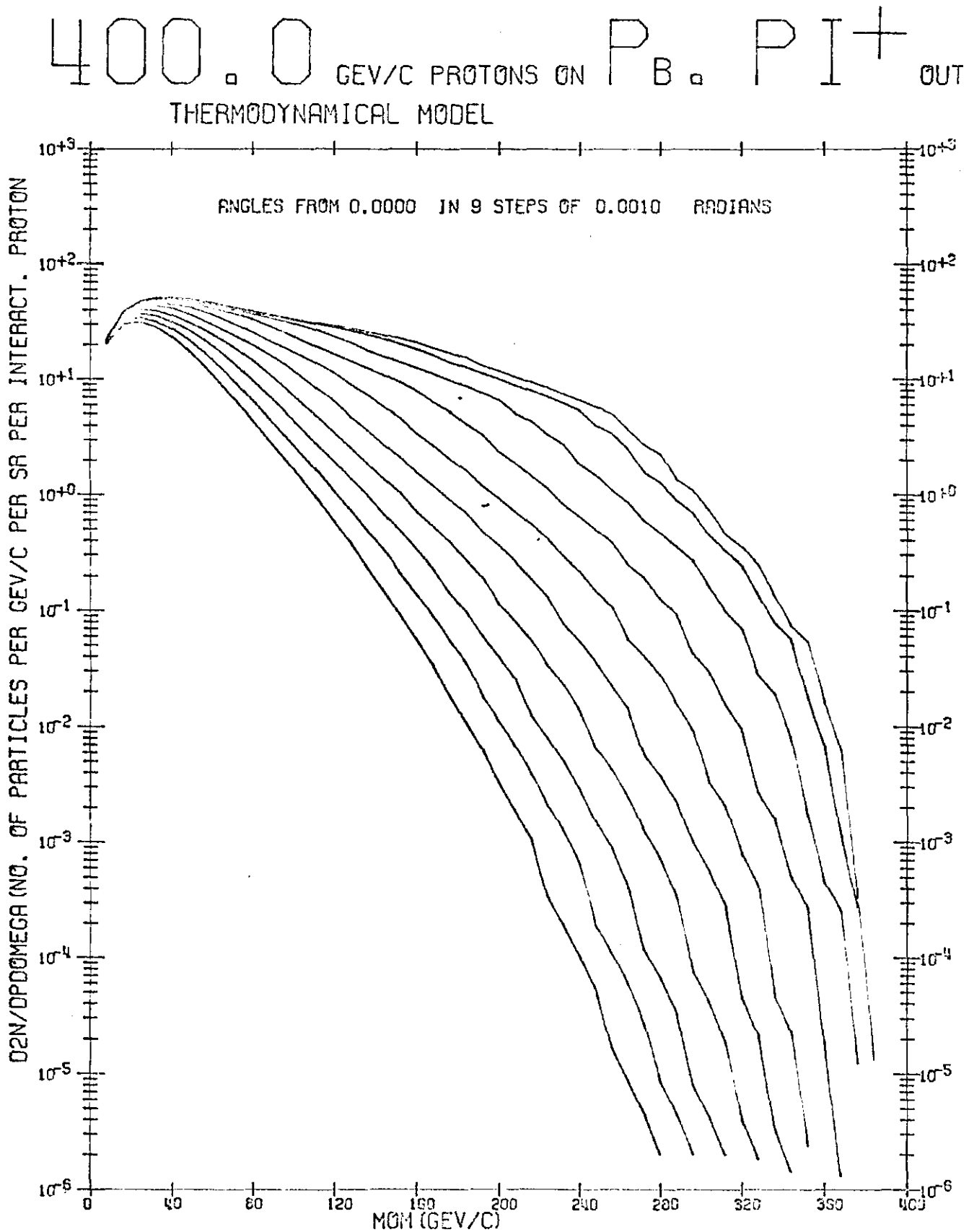

Figure 17a

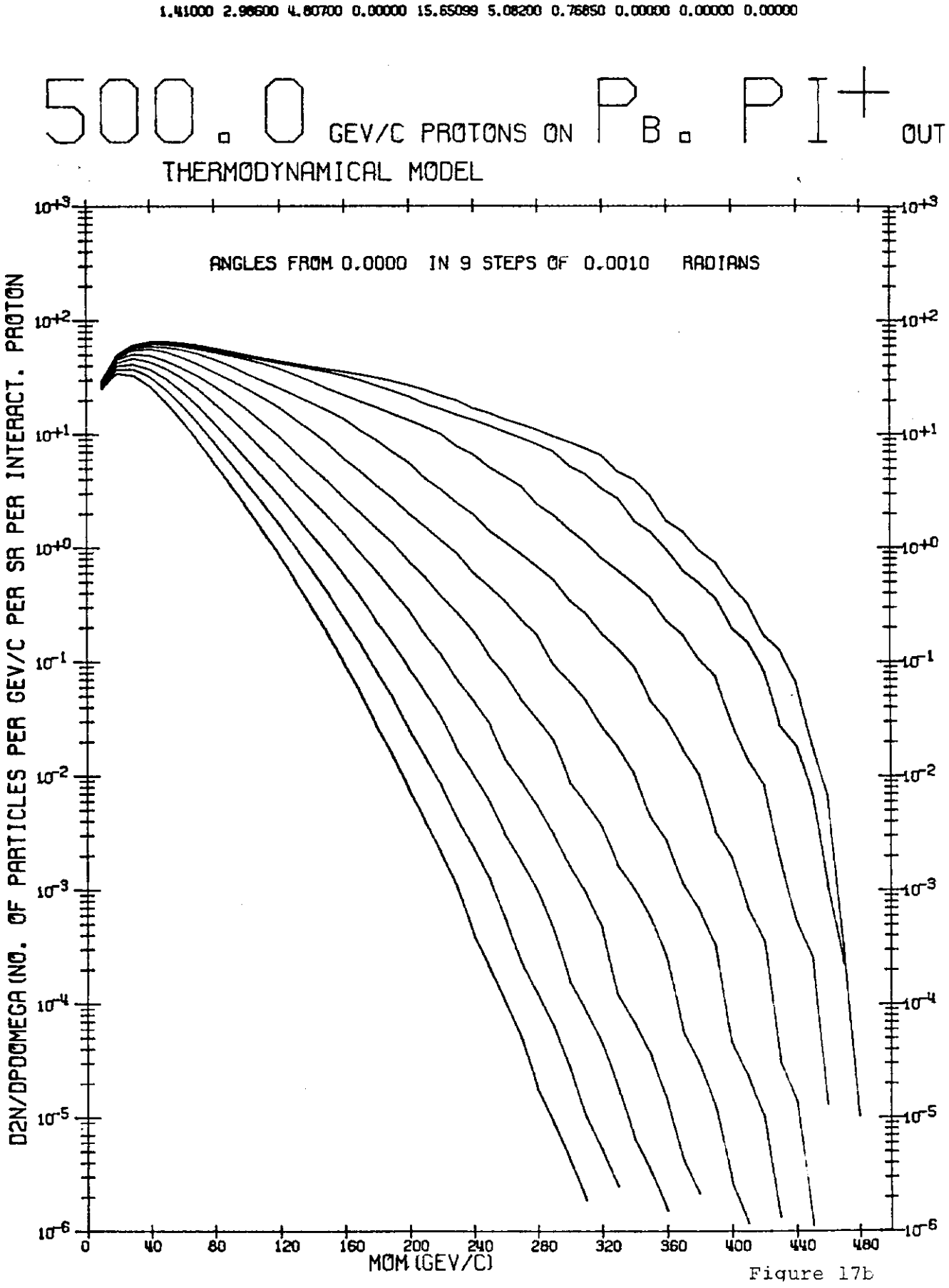
1.41000 2.98600 4.80700 0.00000 15.65099 5.08200 0.76850 0.00000 0.00000 0.00000
500.0 GEV/C PROTONS ON PB. PI+ OUT
THERMODYNAMICAL MODEL
ANGLES FROM 0.0000 IN 9 STEPS OF 0.0010 RADIANS
D2N/DPDOMEGA (NO. OF PARTICLES PER GEV/C PER SR PER INTERACT. PROTON
MOM (GEV/C)
0
40
80
120
160
200
240
280
320
360
400
440
480

Figure 17b

2.23970 0.50000 0.00000 0.00000 4.93600 0.35170 0.64870 0.00000 0.00000 0.00000

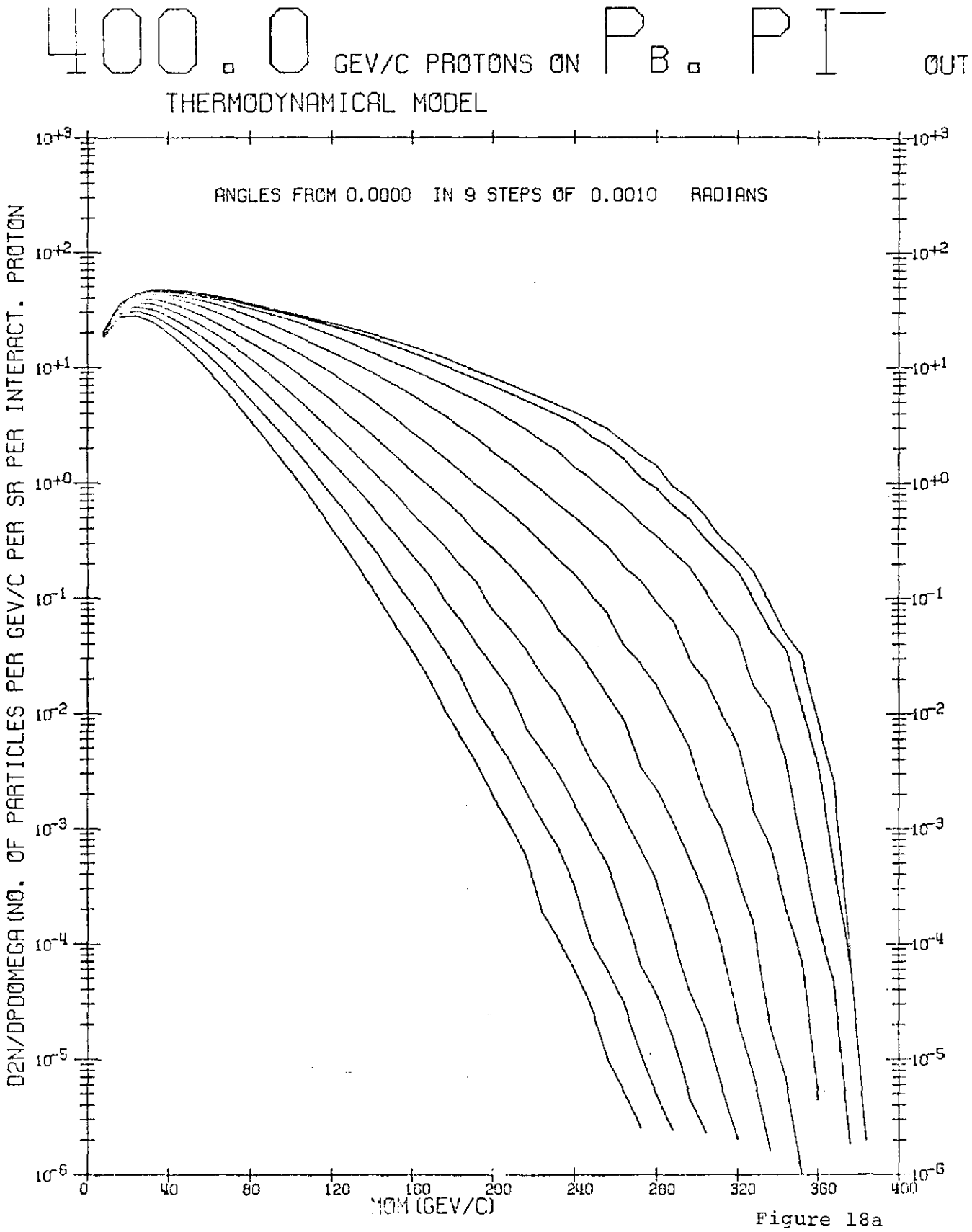

Figure 18a

2.23970 0.50000 0.00000 0.00000 4.93600 0.95470 0.64870 0.00000 0.00000 0.00000

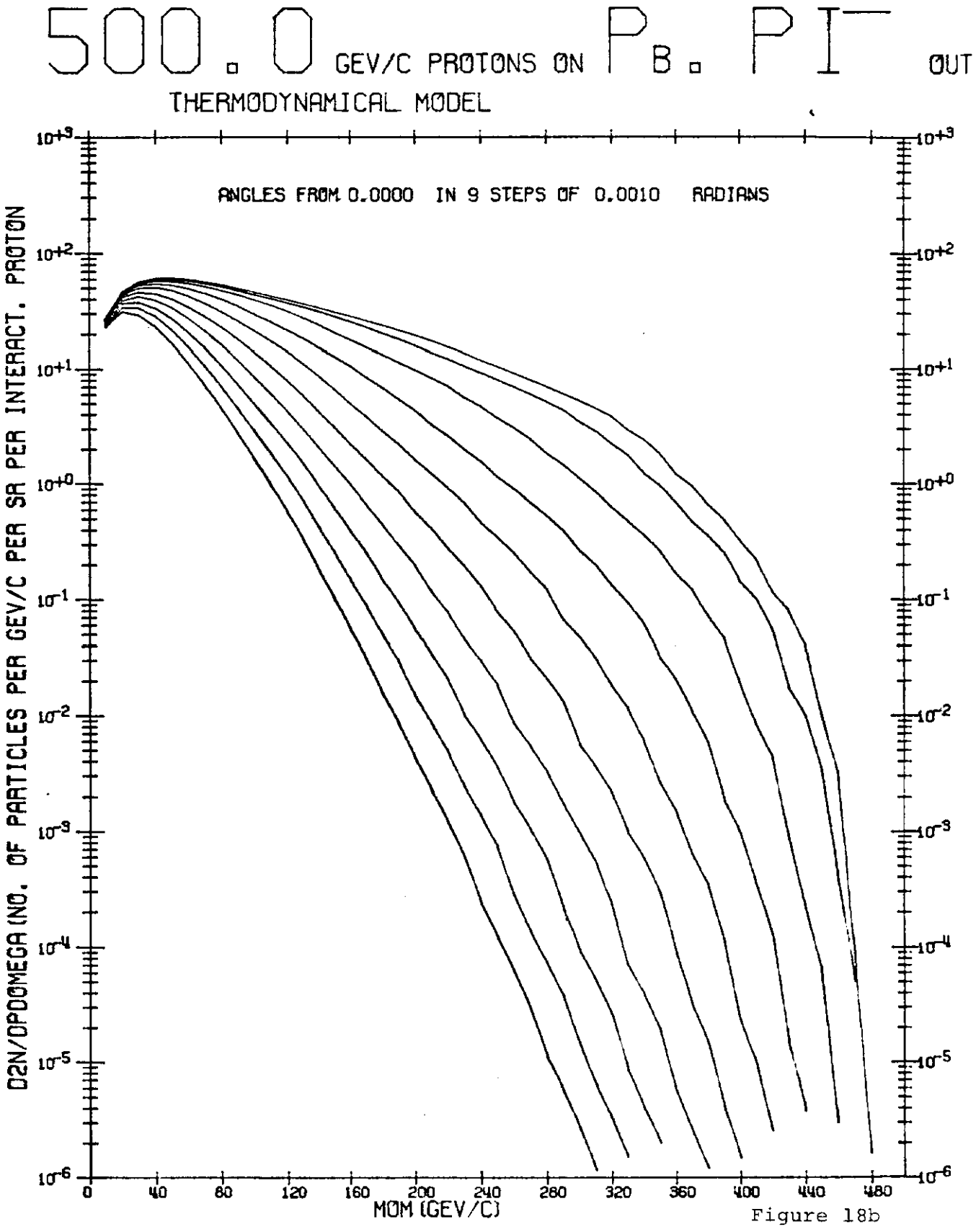

Figure 18b

2.6000 4.02300 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000

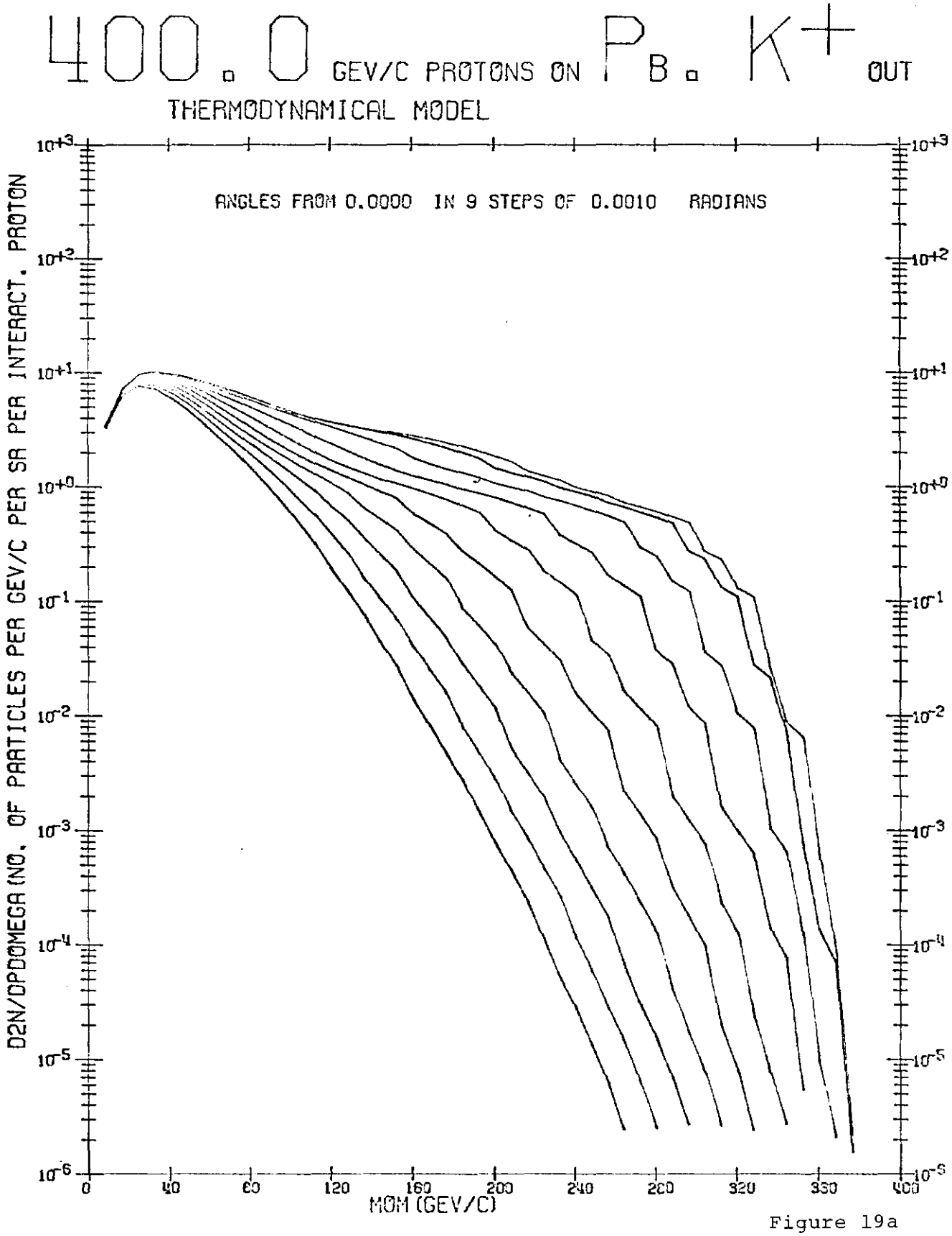

Figure 19a

2.54600 4.82300 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000

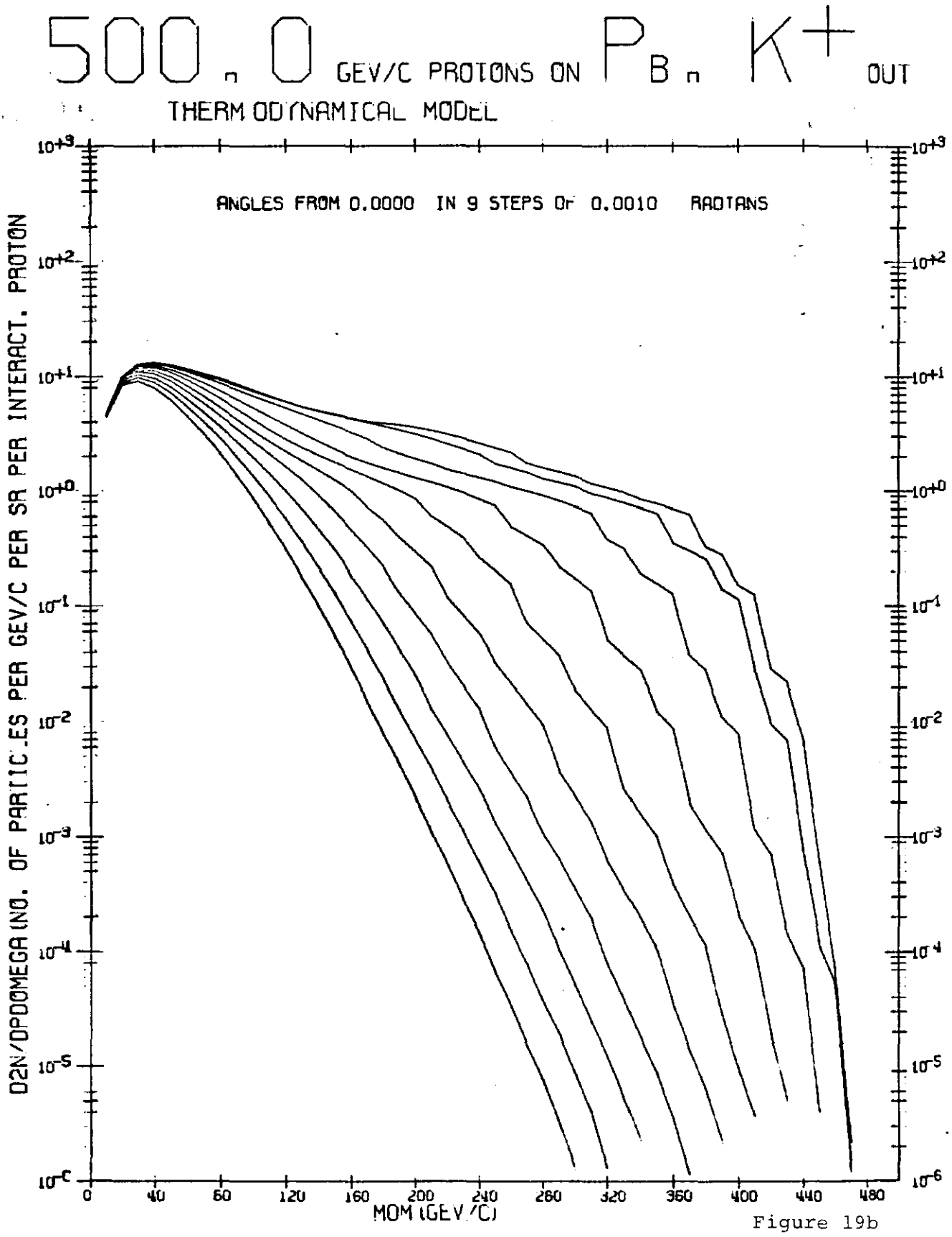

Figure 19b

0.00000 0.00000 5.34910 0.90000 4.90300 0.00000 0.61970 0.00000 0.00000 0.00000

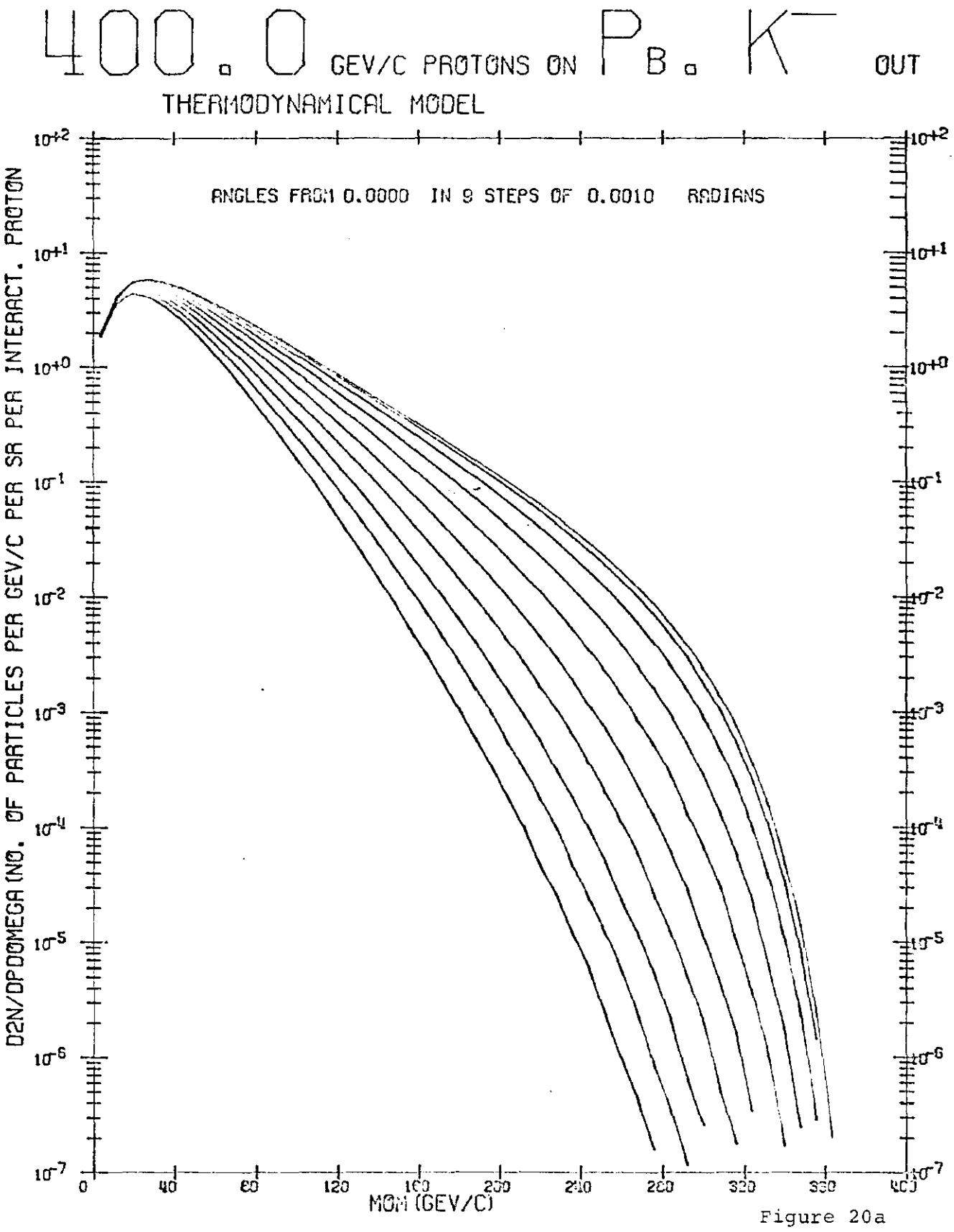

Figure 20a

0.00000 0.00000 5.34810 0.50000 4.93600 0.00000 0.04870 0.00000 0.00000 0.00000

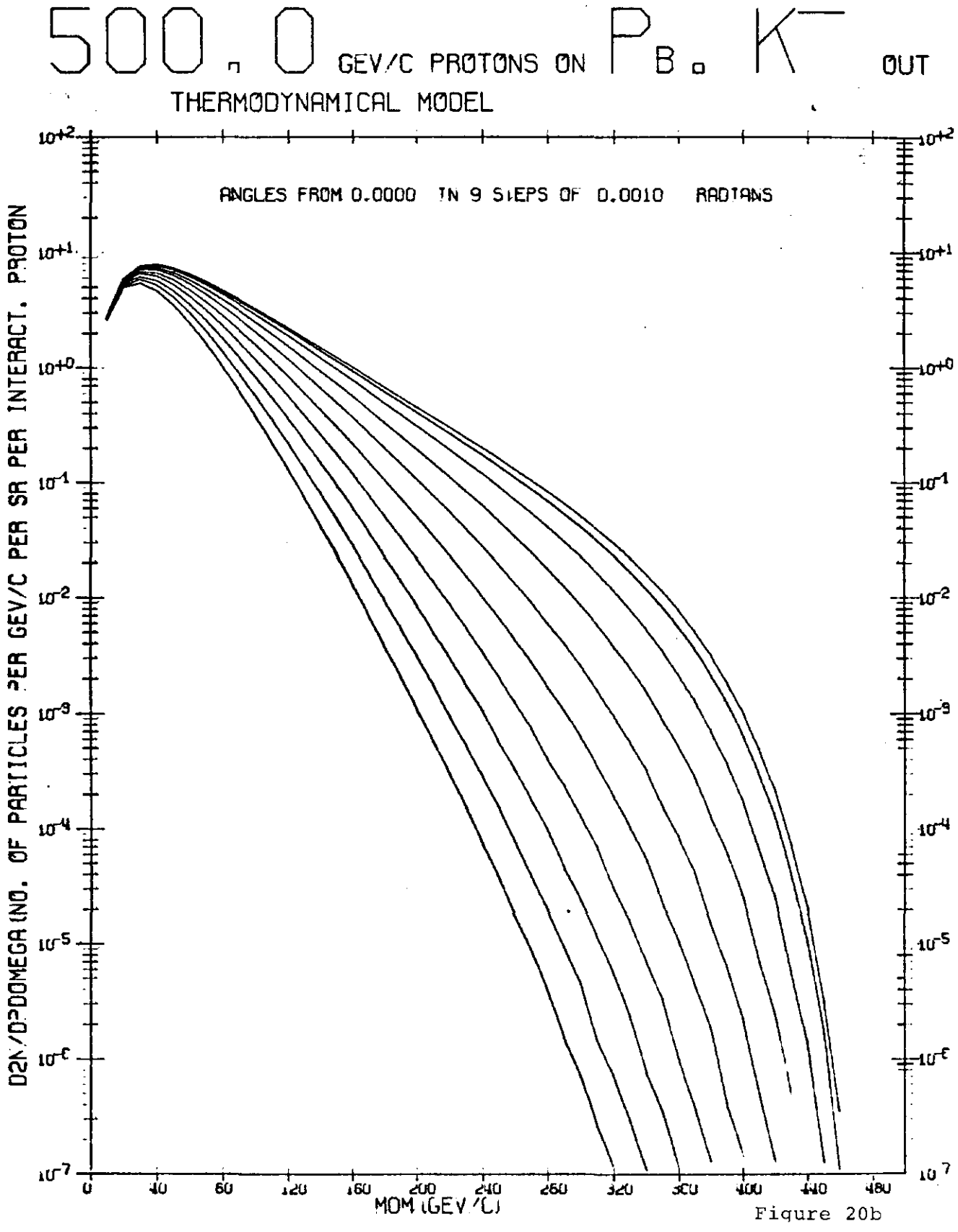

Figure 20b

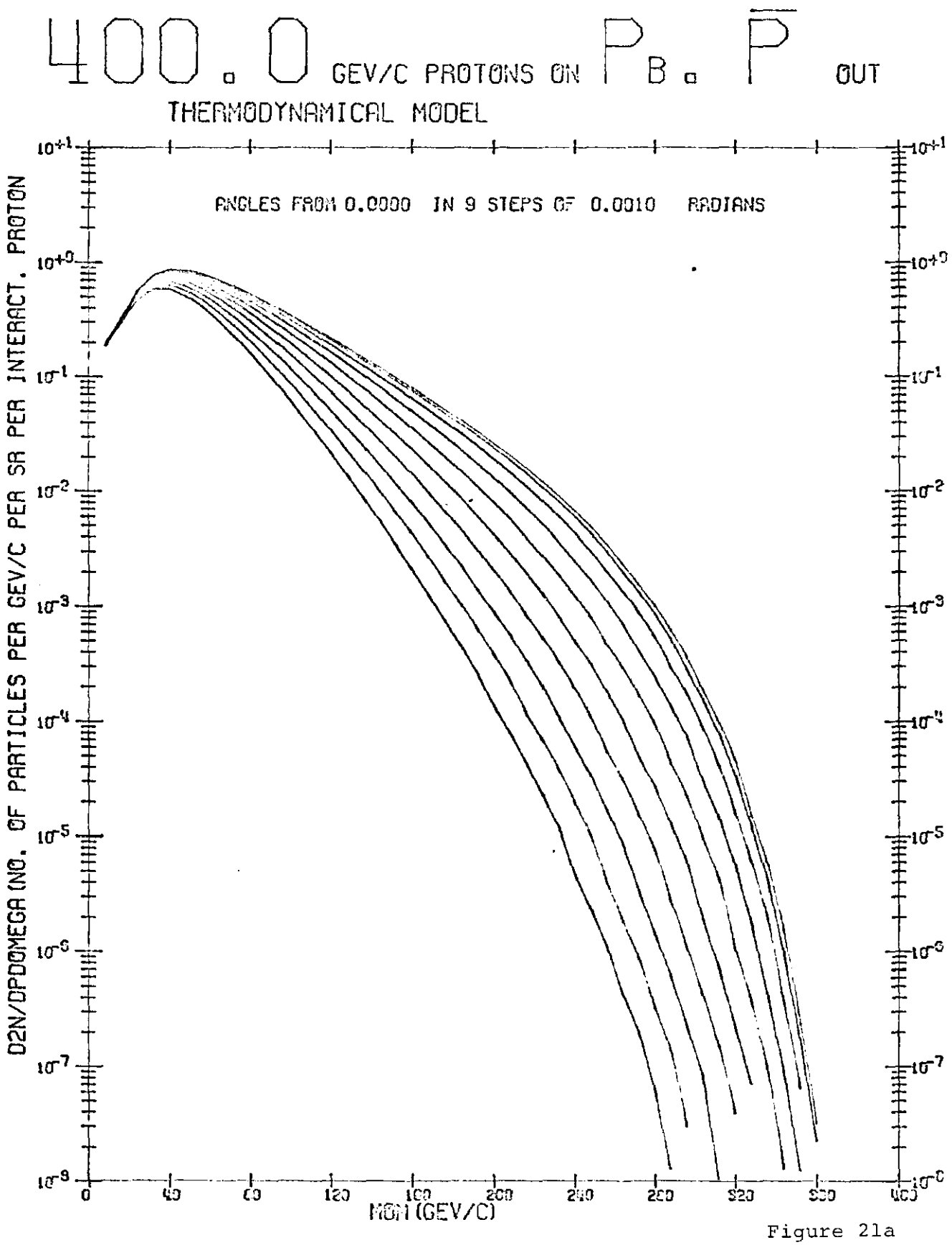
400.0 GEV/C PROTONS ON PB. P̄ OUT
THERMODYNAMICAL MODEL
ANGLES FROM 0.0000 IN 9 STEPS OF 0.0010 RADIANS
D2N/DPDOMEGA (NO. OF PARTICLES PER GEV/C PER SR PER INTERACT. PROTON
MOM (GEV/C)

Figure 21a

0.00000 0.00000 0.12950 0.50000 4.99600 0.00000 0.64870 0.00000 0.00000 0.00000

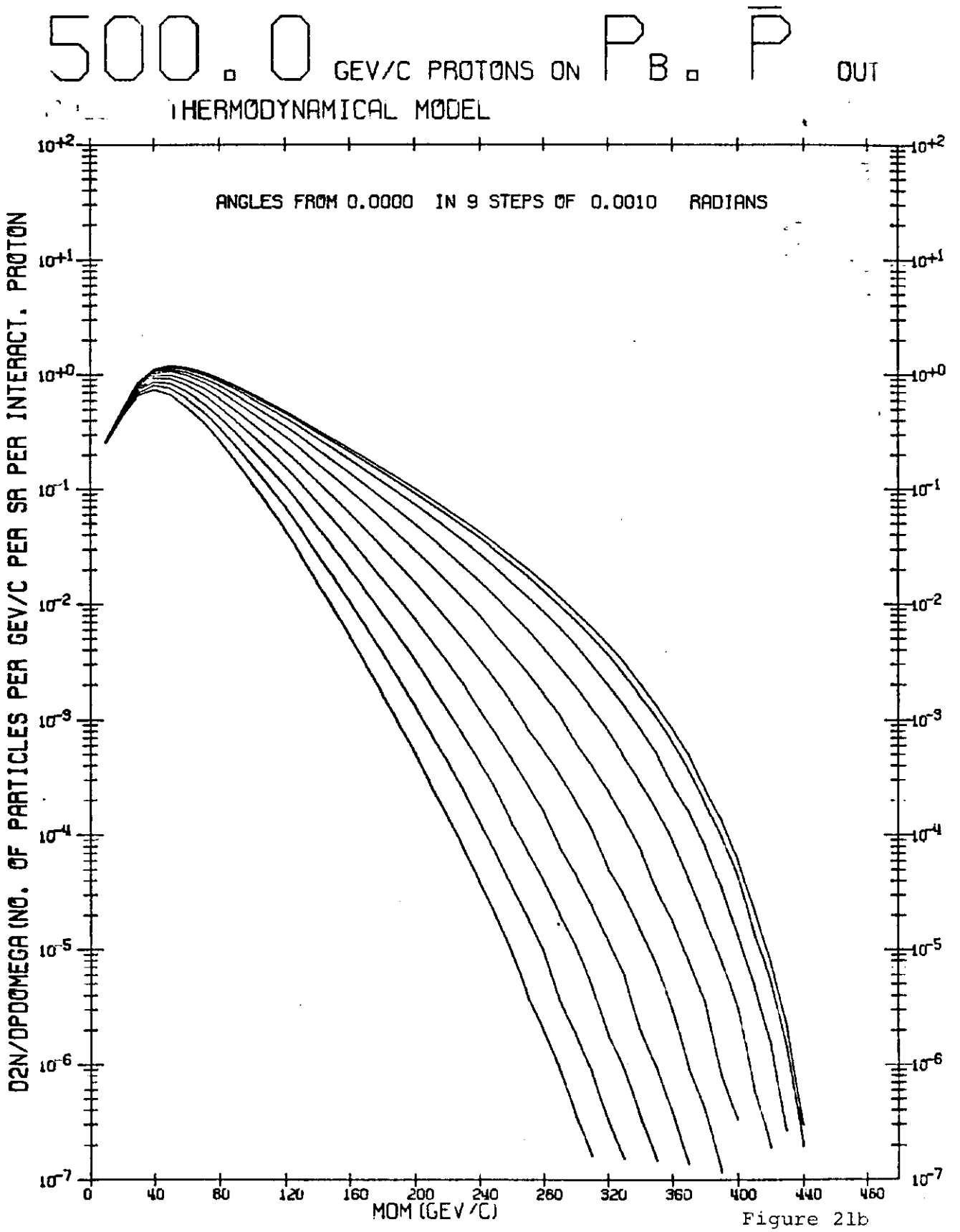

Figure 21b