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ภาคผนวก ก.

การหาตำแหน่งของดวงอาทิตย์

การหาตำแหน่งที่ปรากฏของดวงอาทิตย์บนพื้นโลกสามารถแทนด้วยเทอมของตัวแปร 3 ตัว คือ ตำแหน่งพื้นที่บนโลก, จำนวนวันของปี และเวลาในขณะนั้นซึ่งอยู่ในรูปของมุมทั้ง 3 คือ

1. มุมเส้นรุ้ง (Latitude angle, λ) มีค่าบวกในซีกโลกเหนือ
2. มุมฤดูกาล (Declination angle, δ) ขึ้นอยู่กับจำนวนวันของปี
3. มุมชั่วโมง (Hour angle, τ) มีค่าบวกหลังจากเที่ยงโดยวัดมุมจากเที่ยงวัน

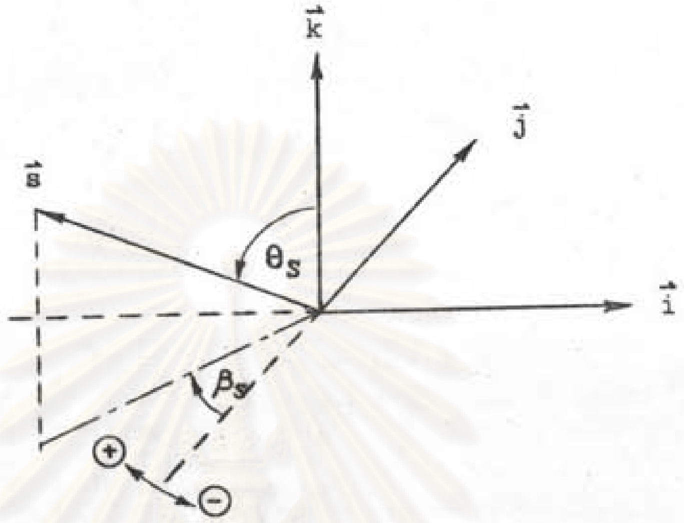
จากค่าของมุมทั้ง 3 ที่วัดได้สามารถกำหนดพิกัดของดวงอาทิตย์ได้ด้วยมุม 2 มุมคือ มุมเซนิท (Zenith Angle, θ_s) เป็นมุมที่แนวรังสีดวงอาทิตย์ทำกับเส้นดิ่ง ณ ตำแหน่งนั้น และมุมอาซิมุท (Azimuth Angle, β_s) เป็นมุมที่วัดจากแนวฉายของรังสีดวงอาทิตย์บนพื้นระดับทำกับแนวทิศใต้จริง ดังรูปที่ ก.1 โดยวัดตามเข็มนาฬิกาเป็นบวก ดังนั้นการหาค่ามุมทั้งสองที่เวลาใด ๆ ของวันที่ต้องการทราบจะได้

$$\cos(\theta_s) = \sin(\lambda).\sin(\delta) + \cos(\lambda).\cos(\delta).\cos(\tau) \quad \ldots (\text{ก}-1)$$

$$\cot(\beta_s) = \frac{\sin(\lambda).\cos(\tau) - \cos(\lambda).\tan(\delta)}{\sin(\tau)} \quad \ldots (\text{ก}-2)$$

หรือ $$\sin(\beta_s) = \sin(\tau).\frac{\cos(\delta)}{\sin(\theta_s)} \quad \ldots (\text{ก}-3)$$

ดังนั้น ถ้าให้ $\vec{i}$, $\vec{j}$ และ $\vec{k}$ เป็นหน่วยเวกเตอร์ซึ่งชี้ไปทางทิศตะวันออก, ทิศเหนือ และทิศตั้งฉากกับพื้นระดับ (ขึ้นบนเป็นบวก) ตามลำดับแล้ว สามารถหาตำแหน่งของดวงอาทิตย์ที่อยู่ในระบบแกนพิกัดทั้งสามนี้ได้ คือ



รูปที่ ก.1 แสดงมุมและหน่วยเวกเตอร์ที่กำหนดตำแหน่งของดวงอาทิตย์

$$\vec{S} = (a_s)\vec{i} + (b_s)\vec{j} + (c_s)\vec{k} \qquad \text{.......... (ก–4)}$$

เมื่อ

$$a_s = -\sin(\theta_s).\sin(\beta_s)$$

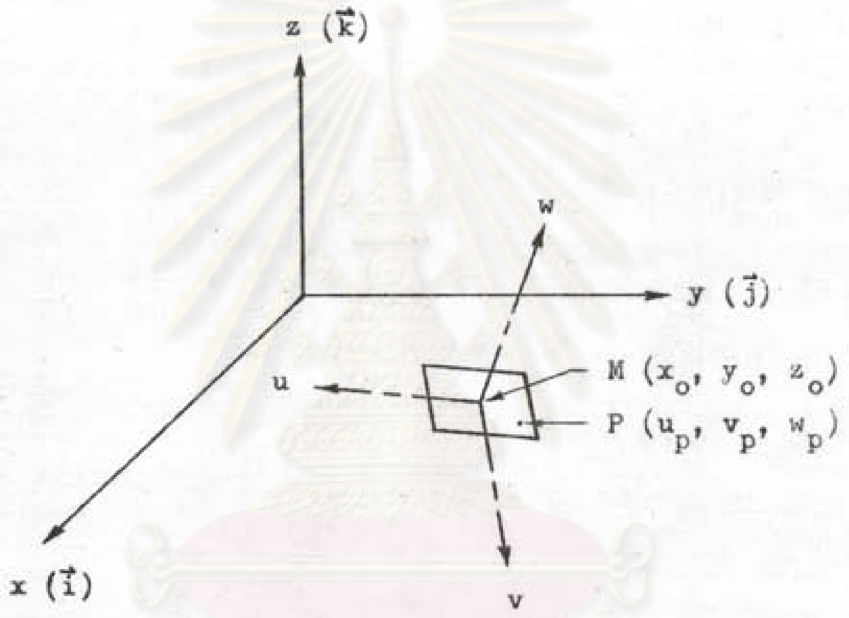
$$b_s = -\sin(\theta_s).\cos(\beta_s)$$

$$c_s = \cos(\theta_s)$$

ภาคผนวก ข.

วิธีการแมพปิ้ง (Mapping)

การแมพปิ้งเป็นวิธีการที่ใช้ในการเปลี่ยนพิกัดของวัตถุจากระบบแกนพิกัดแนวฉาก (Cartesian Coordinate System) ระบบหนึ่งไปอยู่ในระบบแกนพิกัดแนวฉากอีกระบบได้



รูปที่ ข.1 แสดงตำแหน่งของจุด P ซึ่งอยู่ในระบบแกนพิกัดแนวฉากทั้งสองระบบ

พิจารณารูปที่ ข.1 ให้หน่วยเวกเตอร์ $\vec{i}$, $\vec{j}$ และ $\vec{k}$ อยู่ในทิศของแกน x, y, และ z ตามลำดับ โดยมีจุด M อยู่ที่พิกัด (x_o, y_o, z_o) ของระบบแกนพิกัดนี้ และจุด M นี้เป็นจุดกำเนิดของระบบแกนพิกัดแนวฉาก (u, v, w) อีกด้วย โดยมีหน่วยเวกเตอร์ $\vec{u}$, $\vec{v}$ และ $\vec{w}$ อยู่ในทิศของแกน u, v และ w ตามลำดับ ให้ P เป็นจุดใด ๆ ซึ่งมี

พิกัดอยู่ที่ (u_p, v_p, w_p) ในระบบแกนพิกัดแนวฉาก (u, v, w) จากตำแหน่งของจุด P นี้สามารถที่จะกำหนดให้อยู่ในระบบแกนพิกัดแนวฉาก (x, y, z) ได้ สมมติให้จุด P อยู่ที่พิกัด (x_p, y_p, z_p) ซึ่งสามารถหาค่าดังกล่าวได้คือ

$$x_p = L_{11} \cdot u_p + L_{12} \cdot v_p + L_{13} \cdot w_p + x_o$$

$$y_p = L_{21} \cdot u_p + L_{22} \cdot v_p + L_{23} \cdot w_p + y_o \qquad \ldots\ldots\ (\text{ข}-1)$$

$$z_p = L_{31} \cdot u_p + L_{32} \cdot v_p + L_{33} \cdot w_p + z_o$$

เมื่อ $L_{11} = \vec{i}.\vec{u}$, $L_{12} = \vec{i}.\vec{v}$, $L_{13} = \vec{i}.\vec{w}$

$L_{21} = \vec{j}.\vec{u}$, $L_{22} = \vec{j}.\vec{v}$, $L_{23} = \vec{j}.\vec{w}$

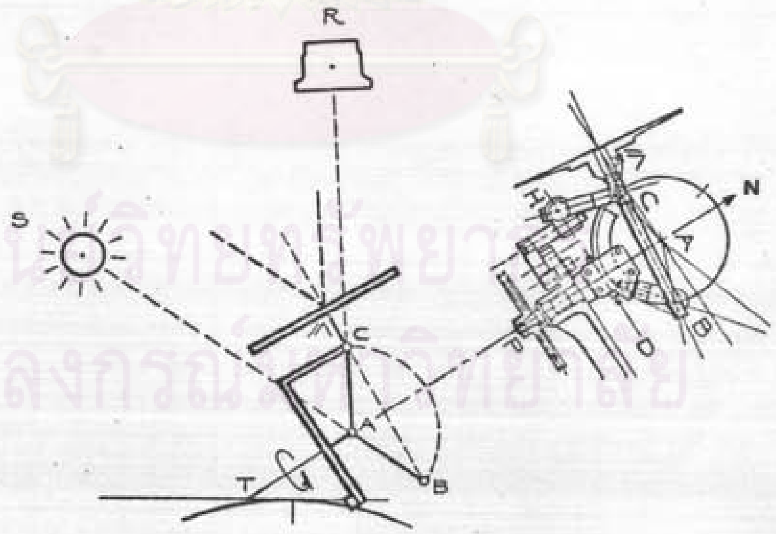
$L_{31} = \vec{k}.\vec{u}$, $L_{32} = \vec{k}.\vec{v}$, $L_{33} = \vec{k}.\vec{w}$

ภาคผนวก ค.

ระบบการหมุนตามดวงอาทิตย์

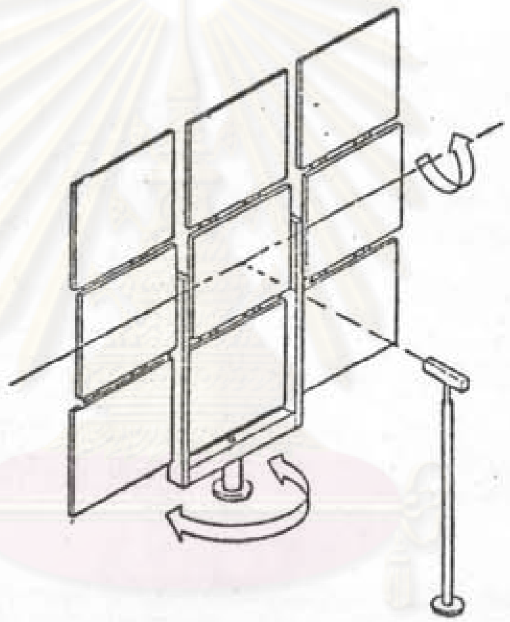
ระบบการหมุนชุดโครงสะท้อนแสงของฮีลีโอสแตทตามการเคลื่อนที่ของดวงอาทิตย์ เพื่อให้รังสีสะท้อนมีทิศทางเข้าสู่ตัวรับตลอดเวลานั้นมี 2 แบบ คือ

ก. Equatorial Mounting การหมุนตามแบบนี้ ประกอบด้วยแกนหมุน 2 แกน วางในแนวตั้งฉากซึ่งกันและกัน โดยแกนหนึ่งอยู่ในแนวแกนของโลกคือวางอยู่ในแนวเหนือ–ใต้จริงของโลก เอียงทำมุมกับพื้นระดับเท่ากับมุมเส้นรุ้ง (Latitude angle) ณ ตำแหน่งที่ติดตั้ง (ในซีกโลกเหนือแกนนี้จะเอียงลาดไปทางทิศใต้) ดังนั้นแกนนี้จะหมุนด้วยความเร็วรอบเท่ากับการหมุนของดวงอาทิตย์รอบโลก (เมื่อเทียบกับจุดสังเกตบนพื้นโลก) ซึ่งมีค่าเท่ากับ 24 ชั่วโมงต่อรอบ ส่วนอีกแกนหนึ่งใช้ปรับตามมุมฤดูกาล (Declination angle) ของดวงอาทิตย์ซึ่งมีค่าเปลี่ยนแปลงเพียงเล็กน้อยในแต่ละวัน ดังรูปที่ ค.1



รูปที่ ค.1 แสดงระบบการหมุนตามดวงอาทิตย์แบบ Equatorial Mounting

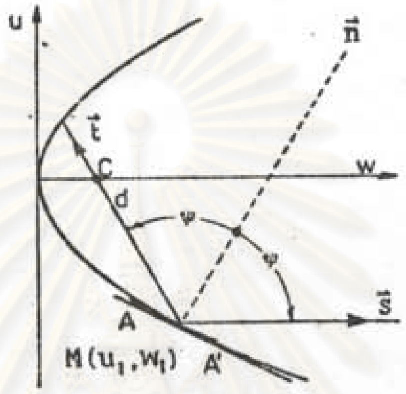
ข. <u>Altazimuth Mounting</u> การหมุนตามแบบนี้ประกอบด้วยแกนหมุน 2 แกน วางในแนวตั้งฉากซึ่งกันและกัน โดยแกนหนึ่งวางอยู่ในแนวดิ่งเพื่อปรับตามค่ามุมอาซีมุท (Azimuth angle, ϕ_h) ของเส้นแนวฉากโครงสะท้อนแสง อีกแกนหนึ่งหมุนตามค่ามุมเหนือหัว (Altitude angle, γ_h) ของเส้นแนวฉากโครงสะท้อนแสง ค่าของมุมอาซีมุทและมุมเหนือหัวต้องคำนวณหาค่า ณ เวลาต่าง ๆ เพื่อนำค่าที่ได้มาใช้ปรับมุมดังกล่าว ฉะนั้นการหันตามแบบนี้จำเป็นต้องอาศัยอุปกรณ์ควบคุมที่ยุ่งยากกว่าแบบแรก แต่สะดวกและง่ายในการติดตั้งใช้งาน ดังรูปที่ ค.2



รูปที่ ค.2 แสดงระบบการหมุนตามดวงอาทิตย์แบบ Altazimuth Mounting

ภาคผนวก ง.

การหาสมการพาราโบลอยด์ในเทอมของมุมรังสีตกกระทบ



รูปที่ ง.1 แสดงรูปพาราโบลอยด์ในระนาบแกน u - w

จากสมการทั่วไปของรูปพาราโบลอยด์ซึ่งมีแกน w เป็นแกนกลางของรูปพาราโบลอยด์จะได้

$$u^2 + v^2 = (4P)w \qquad \text{........(ง-1)}$$

จากรูปที่ ง.1 สามารถหาค่าความชัน (Slope) ที่จุด M จะได้

$$\frac{du}{dw} = \frac{2P}{u} \qquad \text{........ (ง-2)}$$

ดังนั้นสมการของเส้นแนวฉาก ($\vec{n}$) ที่จุด $M(u_1, w_1)$ จะได้

$$u = \left(\frac{u_1}{2P}\right)w - u_1\left(1 + \frac{w_1}{2P}\right) \qquad \text{........ (ง-3)}$$

ให้ ψ เป็นมุมรังสีตกกระทบซึ่งมีค่าเท่ากับมุมระหว่างเส้นแนวฉาก ($\bar{n}$) ทำกับแกน w จะได้

$$\psi = \tan^{-1}\left[\frac{u_1}{2P}\right] \qquad \text{........ (ง–4)}$$

หรือ

$$P = \frac{u_1}{2\tan(\psi)} \qquad \text{........ (ง–5)}$$

แต่ $u_1 = d.\sin(2\psi) = 2d.\sin(\psi).\cos(\psi)$ แทนในสมการที่ (ง–5) จะได้

$$P = d.\cos^2(\psi) \qquad \text{......... (ง–6)}$$

แทนค่า P ในสมการที่ (ง–1) จะได้

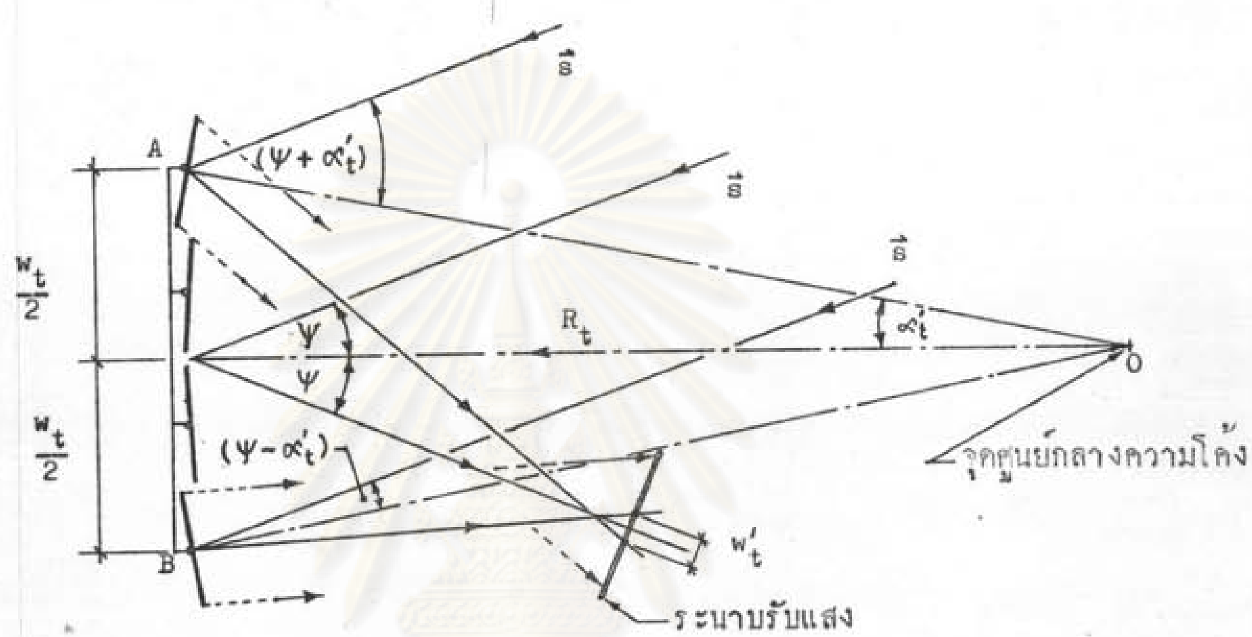
$$u^2 + v^2 = 4.d.\cos^2(\psi).w \qquad \text{........ (ง–7)}$$

เมื่อ d เป็นระยะทางจากจุด M ถึงจุด c

ดังนั้นจะได้สมการที่ (ง–7) เป็นสมการรูปพาราโบลอยด์ที่ขึ้นอยู่ที่ค่า d และมุม ψ

ภาคผนวก จ.

สมการหาขนาดภาพสะท้อนที่เกิดจากกระจกแผ่นราบประกอบ



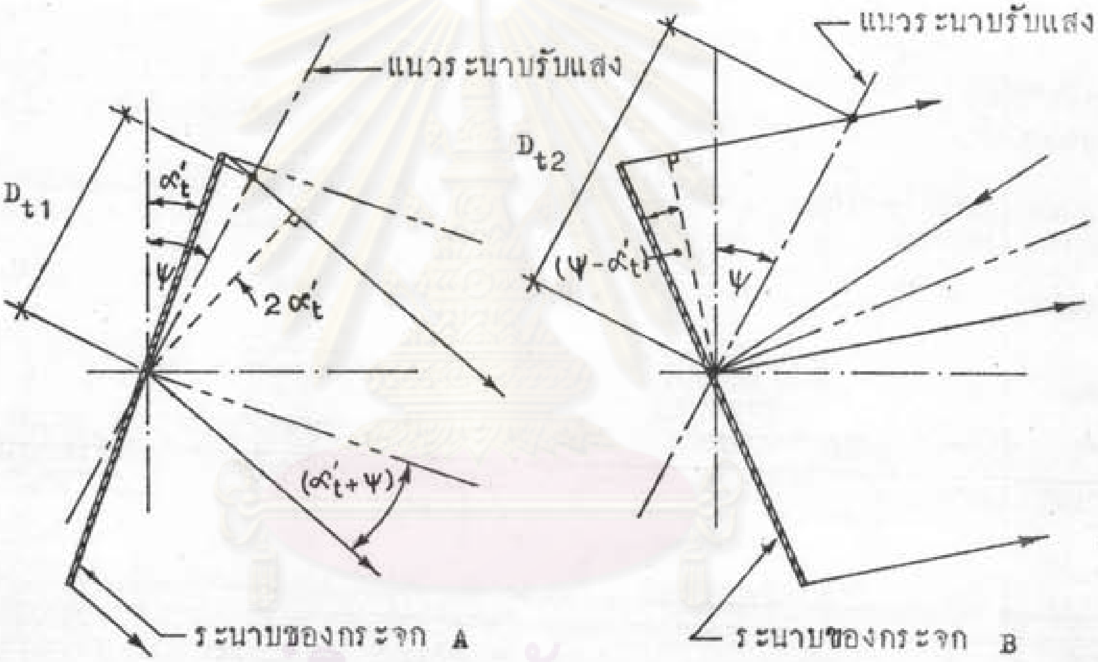
รูปที่ จ.1 แสดงทิศทางของรังสีสะท้อนที่เกิดจากกระจกบานริม A และ B ของผิวสะท้อนแสงในระนาบรังสีตก–สะท้อน

การหาขนาดของภาพสะท้อนที่เกิดจากกระจกแผ่นราบประกอบที่มีเส้นแนวฉาก จากจุดกึ่งกลางของกระจกแต่ละบานไปตัดกันที่จุดศูนย์กลางความโค้ง O ซึ่งมีรัศมีความโค้ง R_t และ R_s ในแต่ละระนาบนั้น มีวิธีการหาขนาดของภาพเช่นเดียวกับการหาจากกระจกโค้งโดยแบ่งขนาดของภาพสะท้อนออกเป็นสองส่วนคือหาขนาดความกว้างสุดของรังสีสะท้อนที่ออกจากจุดกึ่งกลางของกระจกแต่ละบานที่ปรากฏบนระนาบรับแสงเนื่องจากจุดกึ่ง–

กลางของกระจกแต่ละบานจะเป็นส่วนหนึ่งของผิวรูปโคนัท ดังนั้นระยะห่างที่สุดของภาพ - สะท้อนในส่วนนี้จะได้

$$w_t' = w_t \left| \cos(\psi_s) - \cos(\psi) \right| + \beta_s \cdot d \qquad \ldots\ldots (จ-1)$$

อีกส่วนหนึ่งเป็นขนาดของภาพที่เพิ่มขึ้นเนื่องจากการใช้กระจกแผ่นราบประกอบ ดังรูปที่ จ.1 แสดงให้เห็นขนาดของภาพสะท้อนที่เพิ่มขึ้นเนื่องจากกระจก A และ B มีค่า D_{t1} และ D_{t2} ตามลำดับ ดังรูปที่ จ.2 ซึ่งจะได้



รูปที่ จ.2 แสดงลักษณะของภาพสะท้อนที่เกิดจากกระจก A และ B

$$D_{t1} = \frac{D_t}{2} \cos(\psi + \alpha_t') \cdot \sec(2 \cdot \alpha_t') \qquad \ldots\ldots (จ-2)$$

และ

$$D_{t2} = \frac{D_t}{2} \cos(\psi - \alpha_t') \cdot \sec(2 \cdot \alpha_t') \qquad \ldots\ldots (จ-3)$$

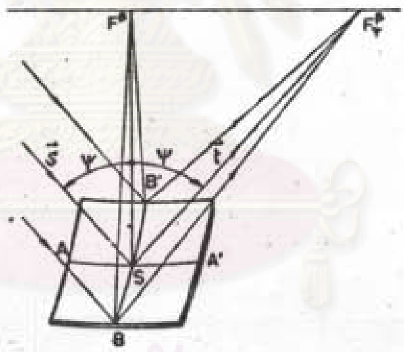
ดังนั้นขนาดของภาพสะท้อนที่เกิดขึ้นจากกระจกแผ่นราบทุก ๆ บานจะได้

$$w = w_t \left| \cos(\psi_s) - \cos(\psi) \right| + \frac{D_t}{2}\left[\cos(\psi + \alpha'_t) + \cos(\psi - \alpha'_t)\right].$$

$$\sec(2.\alpha'_t) + \beta_s.d \qquad \text{........} \quad (\text{จ}-4)$$

ในทำนองเดียวกันขนาดของภาพสะท้อนที่ได้ในระนาบของรัศมีความโค้ง R_s ประกอบด้วยขนาดของภาพที่เกิดจากจุดกึ่งกลางของแผ่นกระจก และขนาดความยาวของแผ่นกระจก ดังแสดงในรูปที่ จ.3 จะได้

$$H = h_t.\left|1 - \frac{\cos(\psi)}{\cos(\psi_s)}\right| + D_s.\sec(\alpha'_s) + \beta_s.d \quad \text{....}(\text{จ}-5)$$



รูปที่ จ.3 แสดงทิศทางของรังสีสะท้อนที่เกิดในระนาบของรัศมีความโค้ง R_s

เมื่อ $\alpha'_s = h_t.\cos(\psi)/R_s$

$\alpha'_t = \tan^{-1}(w_t/2.R_t)$

ภาคผนวก ฉ.

ค่าความเข้มรังสีตรงของดวงอาทิตย์

การหาค่าความเข้มรังสีตรงของดวงอาทิตย์เพื่อใช้เป็นข้อมูลป้อนโปรแกรมคอมพิวเตอร์ นิยมจัดทำอยู่ในรูปของสมการทางคณิตศาสตร์ซึ่งช่วยให้สะดวกในการหาค่าความเข้มรังสีตรงที่เวลาและวันใด ๆ ในรอบปีได้ สมการดังกล่าวประกอบด้วย

1. __Air mass__ ขึ้นอยู่กับค่าความกดอากาศ (Patm, mb.) และค่ามุมเซนิท (θ_s) หรือมุมอัลติจูด ($90 - \theta_s$) ของดวงอาทิตย์ในขณะนั้น

$$\text{Airm} = \text{Patm}/\left[1000 \times \cos(\theta_s)\right] \qquad \text{...... ฉ-1}$$

2. __Turbidity__ ขึ้นอยู่กับปริมาณไอน้ำที่แทรกตัวอยู่ในอากาศโดยวัดเป็นค่าความสูงของน้ำ (Wa, cm.) และค่าความขุ่นมัวของอากาศซึ่งอยู่ในเทอมของค่าสัมประสิทธิ์การขุ่นมัว (Turbidity Coefficient, β_e) จะได้

$$\text{Turb.} = \frac{\left[(90^\circ - \theta_s) + 85^\circ\right]}{\left[(39.5)e^{-Wa} + 47.4\right]} + 0.1 + (16 + 0.22\ Wa).\beta_e \qquad \text{...ฉ-2}$$

3. __Extraterrestrial Radiation__ เป็นค่าความเข้มรังสีดวงอาทิตย์ที่วัดนอกบรรยากาศของโลก (H_o) ขึ้นอยู่กับระยะทางจากโลกถึงดวงอาทิตย์

$$H_o = 1353.0\left[1.0 - \sin(\delta)/11.5\right] \qquad \text{....... ฉ-3}$$

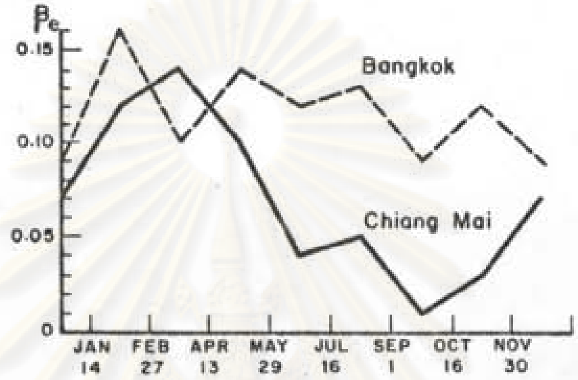
ค่าต่าง ๆ จากสมการทั้งสามซึ่งมีผลโดยตรงต่อค่าความเข้มรังสีตรงที่วัดได้บนพื้นโลก สามารถนำมาเขียนสมการหาค่าความเข้มรังสีตรงที่ได้รับในแนวตั้งฉากกับทิศทางของรังสี (จากเอกสารอ้างอิง[27]) จะได้

$$SDIRT = H_o \cdot e^{[-Airm.Turb/(5.6\sqrt{Airm + 5} - 3.7)]} \quad \text{.... ฉ-4}$$

สำหรับค่าความเข้มรังสีตรงที่กรุงเทพ ฯ นั้น ทางสถาบันเทคโนโลยีแห่งเอเชียได้ดำเนินการวัดและวิเคราะห์หาค่าสัมประสิทธิ์การขุ่นมัว (β_e) และค่าปริมาณไอน้ำ (Wa) ในเอกสารอ้างอิง (26) ส่วนค่า Patm ได้จากเอกสารอ้างอิง (25) ดังแสดงในตารางที่ ฉ.1 และรูปที่ ฉ.1 สำหรับค่ามุม θ_s คำนวณจากสมการที่ ก-1

Date	Bangkok		
	Patm.	Wa	β_e
21 March	1010.48	4.63	0.10
21 June	1006.19	5.56	0.12
21 Sep.	1007.35	5.41	0.09
21 Dec.	1012.13	3.92	0.09

ตารางที่ ฉ.1 แสดงค่า Patm, Wa และ β_e ของกรุงเทพ ฯ ในวันต่าง ๆ ของปี



รูปที่ ฉ.1 แสดงค่า β_e ของกรุงเทพ ฯ ในรอบปี

ภาคผนวก ซ.

ผังงานและโปรแกรมที่จัดทำ

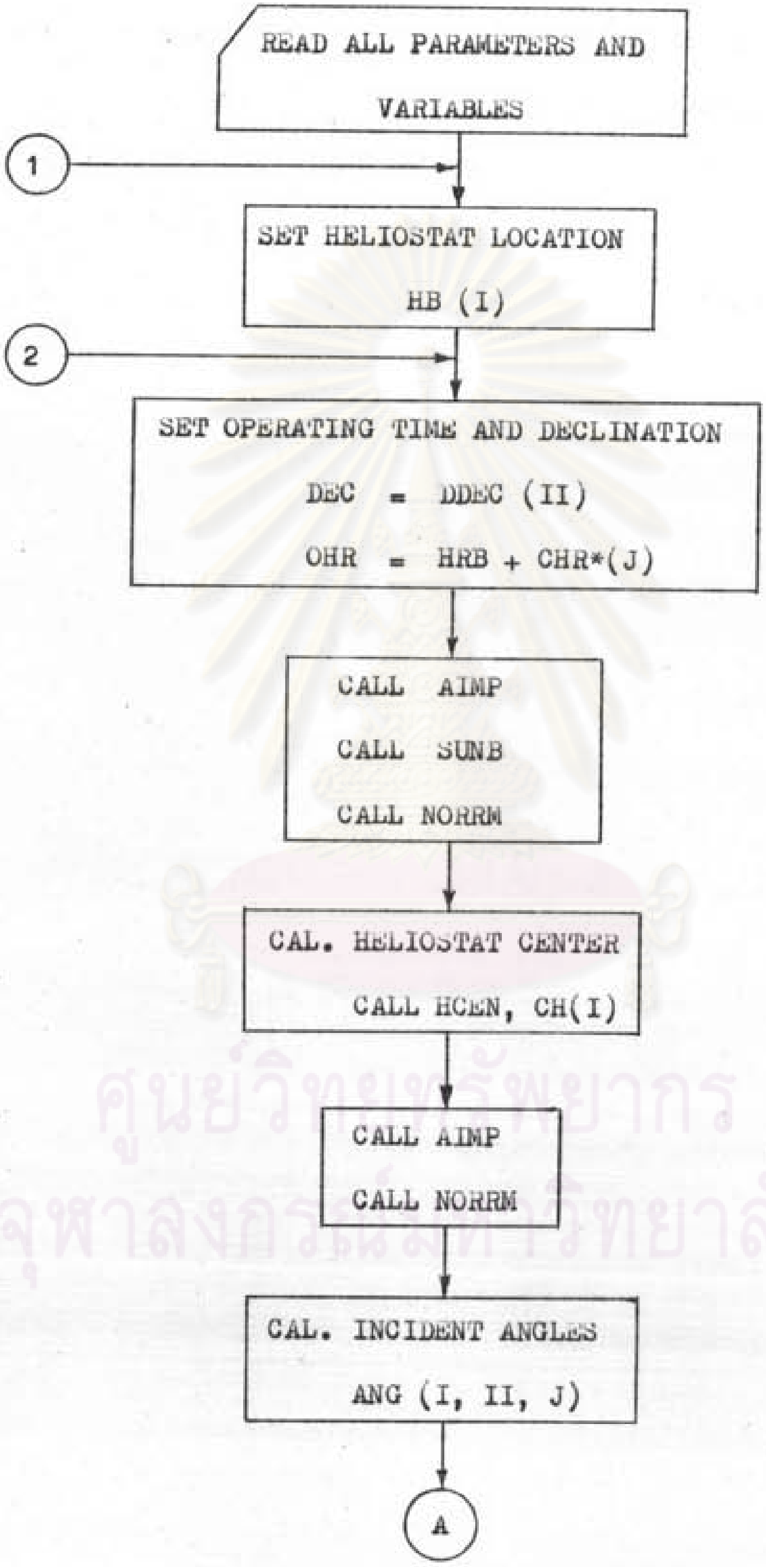
การจัดส่วน

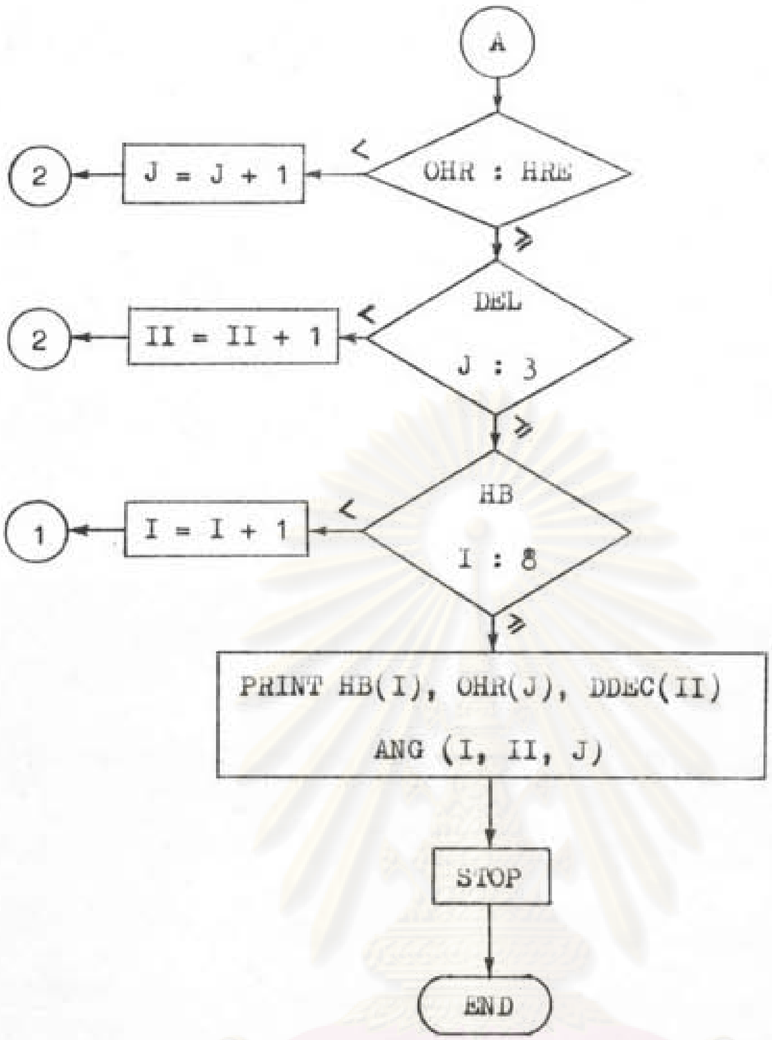
ภาคผนวกนี้แบ่งออกเป็น 2 ส่วน คือ

1. ผังงานสำหรับโปรแกรมหลัก 3 โปรแกรม
2. โปรแกรมที่จัดทำประกอบด้วยโปรแกรมหลัก 3 โปรแกรม และโปรแกรมย่อยชนิดซับรูทีน 11 โปรแกรม

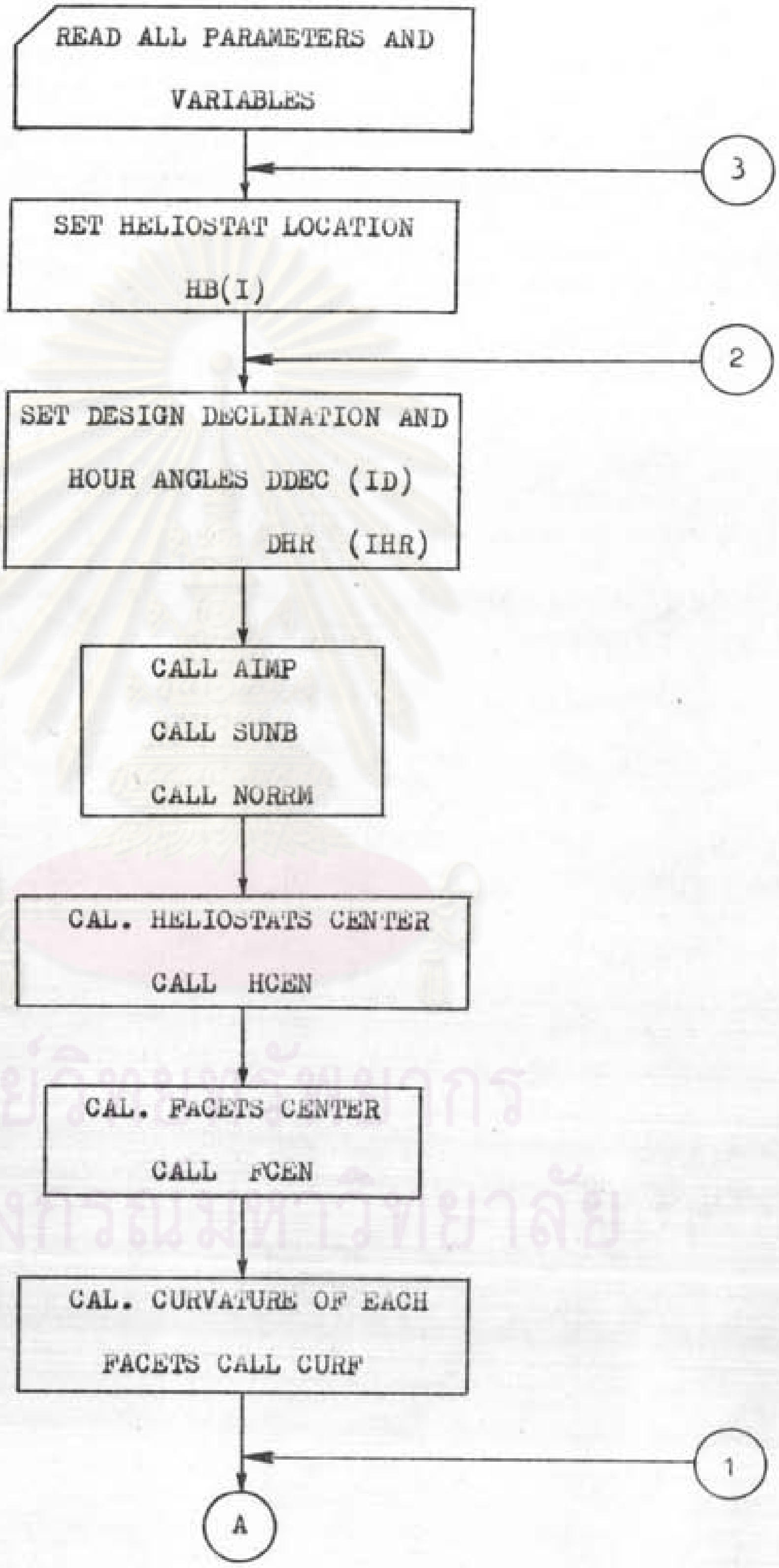
1. แสดงผังงานของโปรแกรมทั้ง 3 โปรแกรม

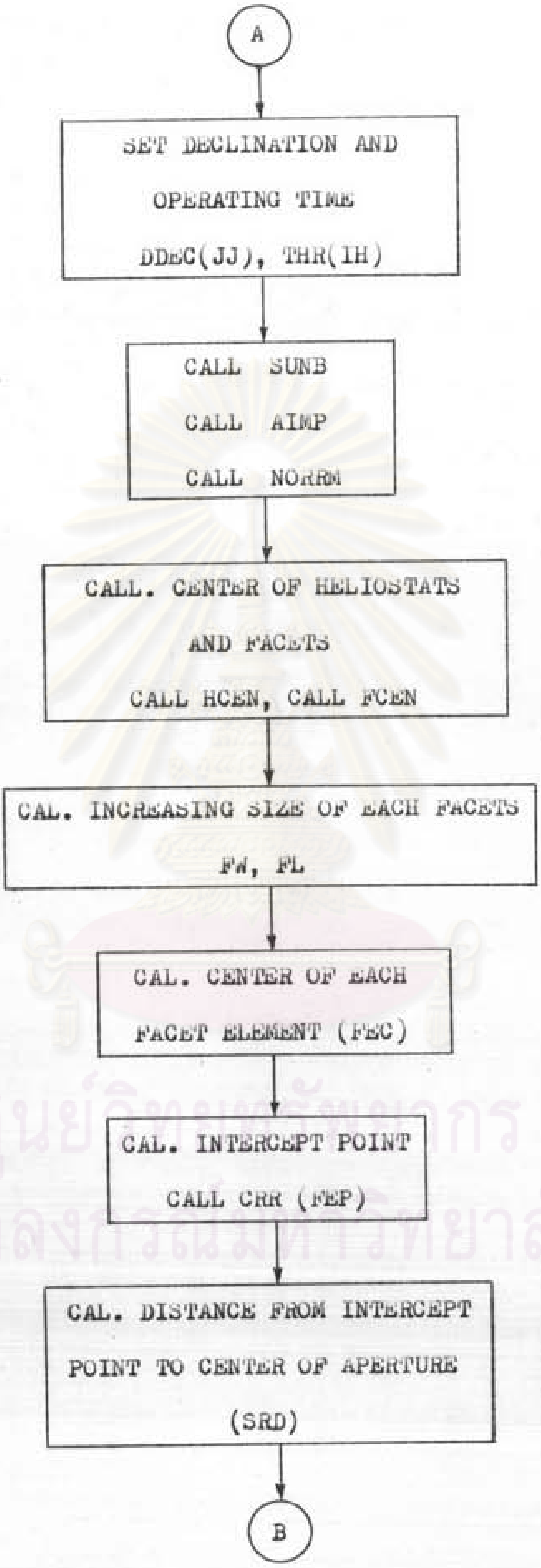
MAINPROGRAM FOR CALCULATING INCIDENT ANGLES

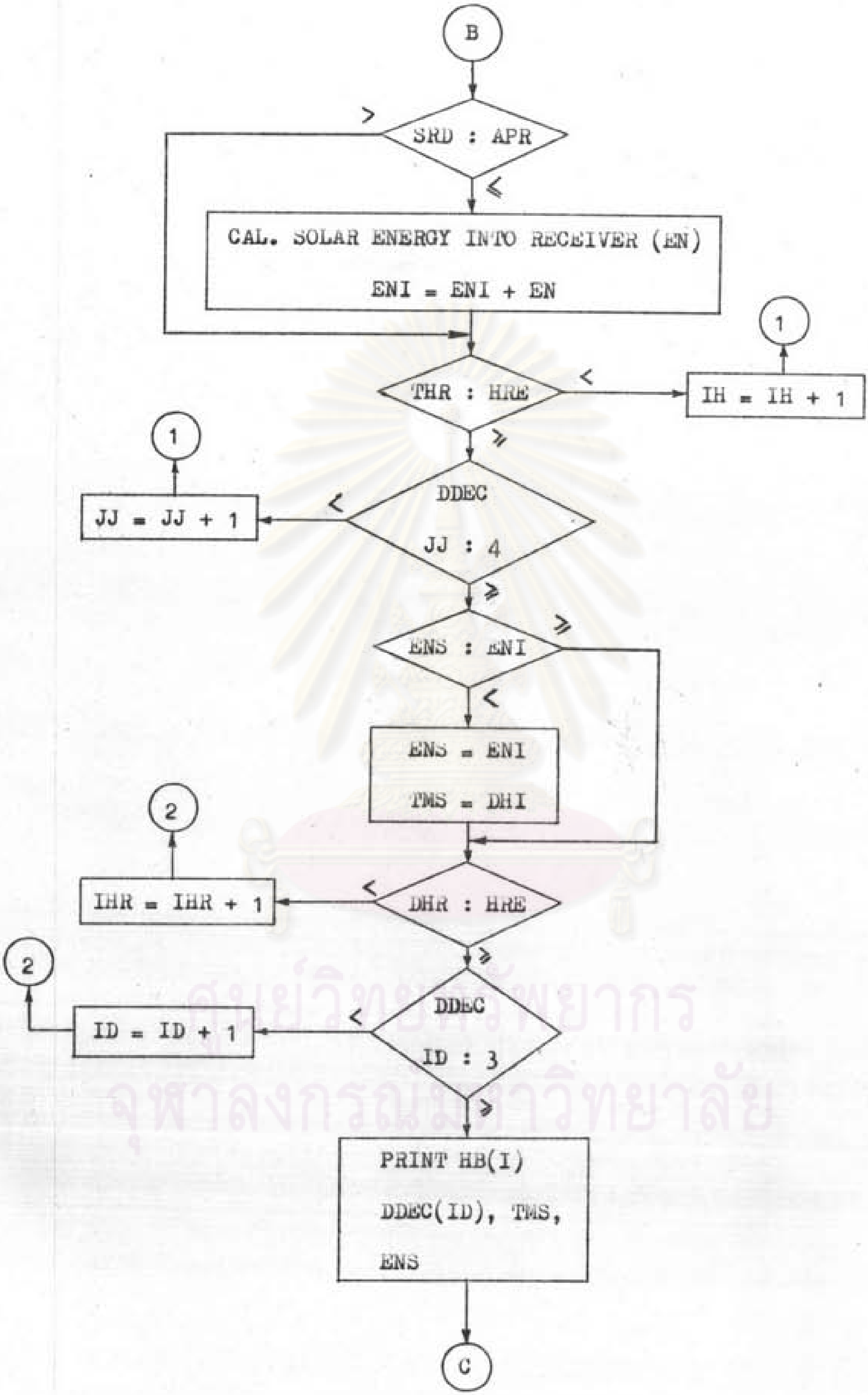



A
OHR : HRE
<
J = J + 1
2
≥
DEL
J : 3
<
II = II + 1
2
≥
HB
I : 8
<
I = I + 1
1
≥
PRINT HB(I), OHR(J), DDEC(II)
ANG (I, II, J)
STOP
END

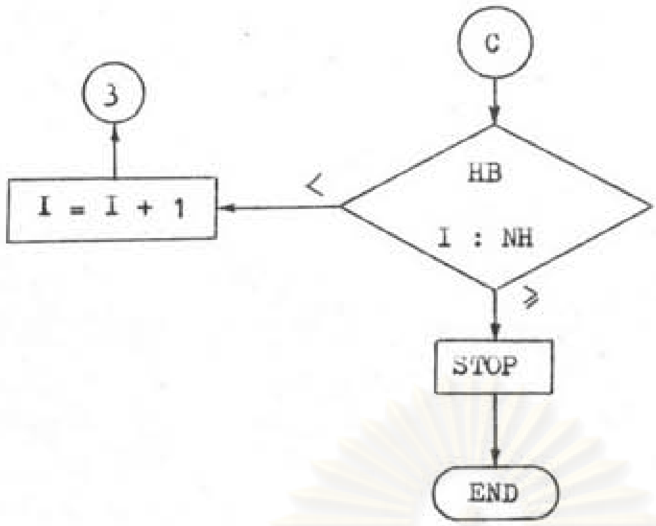
MAINPROGRAM FOR DESIGN CURVATURE OF REFLECTING SURFACES



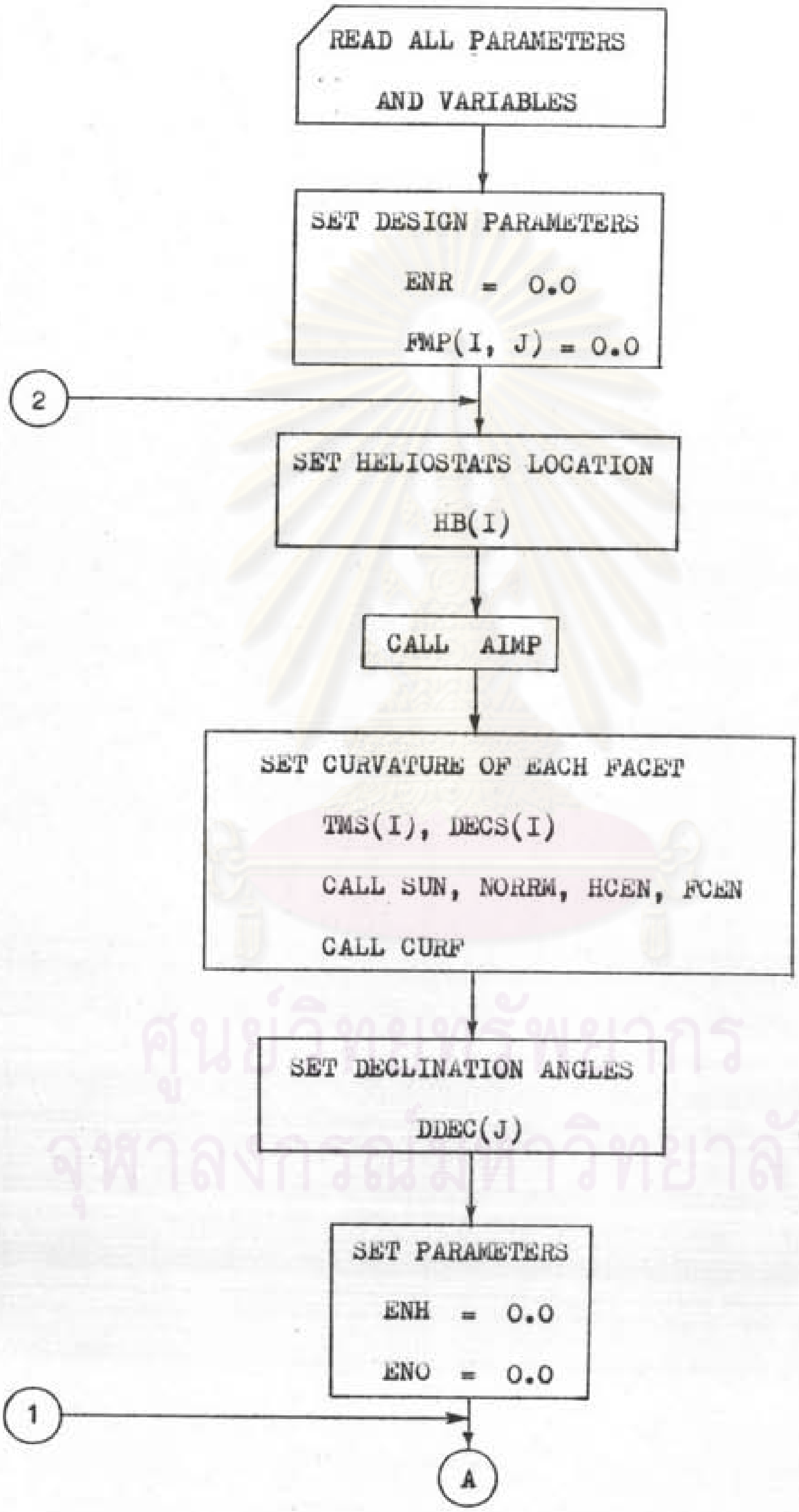

A
SET DECLINATION AND OPERATING TIME DDEC(JJ), THR(IH)
CALL SUNB
CALL AIMP
CALL NORRM
CALL. CENTER OF HELIOSTATS AND FACETS
CALL HCEN, CALL FCEN
CAL. INCREASING SIZE OF EACH FACETS FW, FL
CAL. CENTER OF EACH FACET ELEMENT (FEC)
CAL. INTERCEPT POINT
CALL CRR (FEP)
CAL. DISTANCE FROM INTERCEPT POINT TO CENTER OF APERTURE (SRD)
B

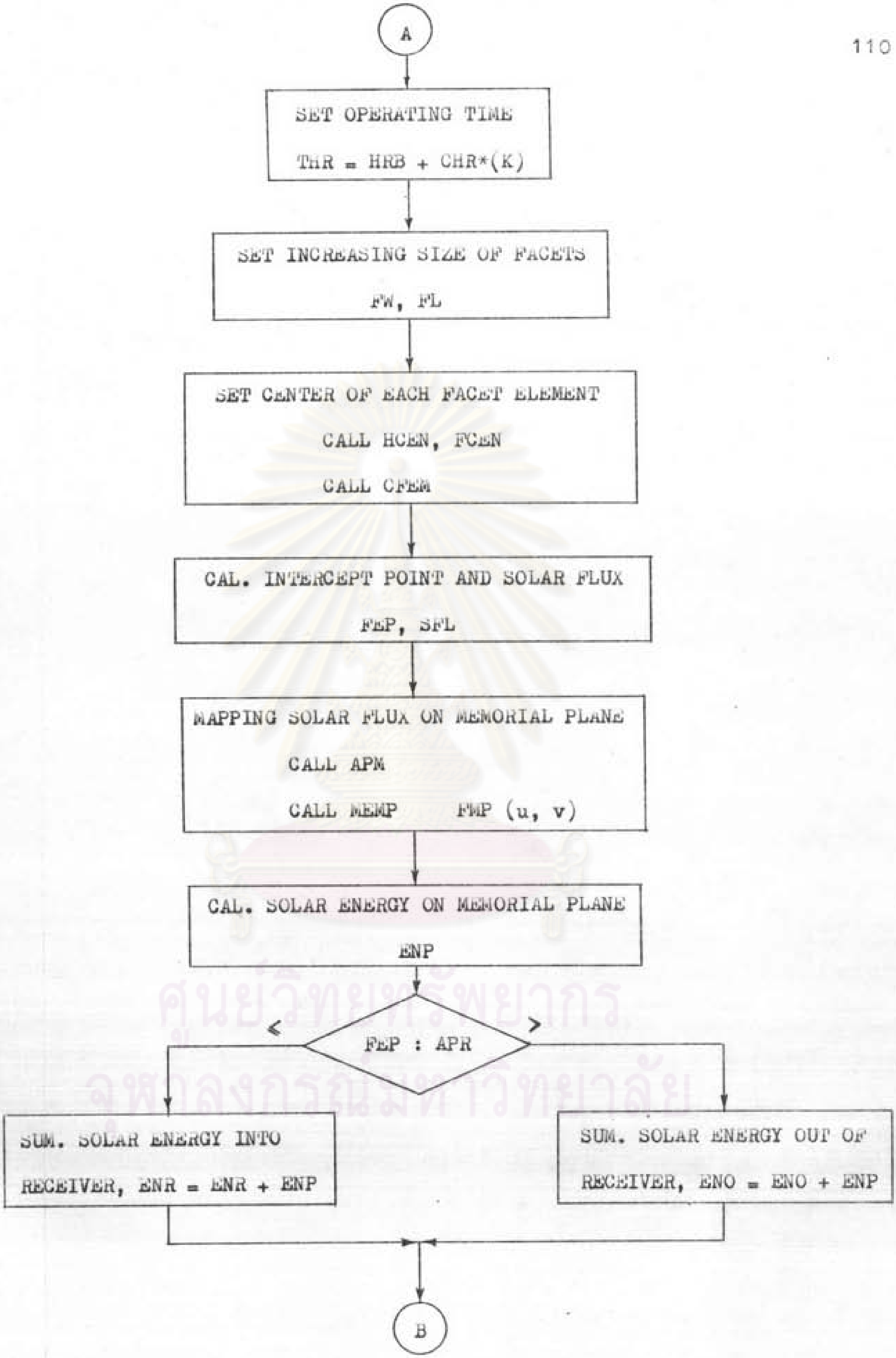


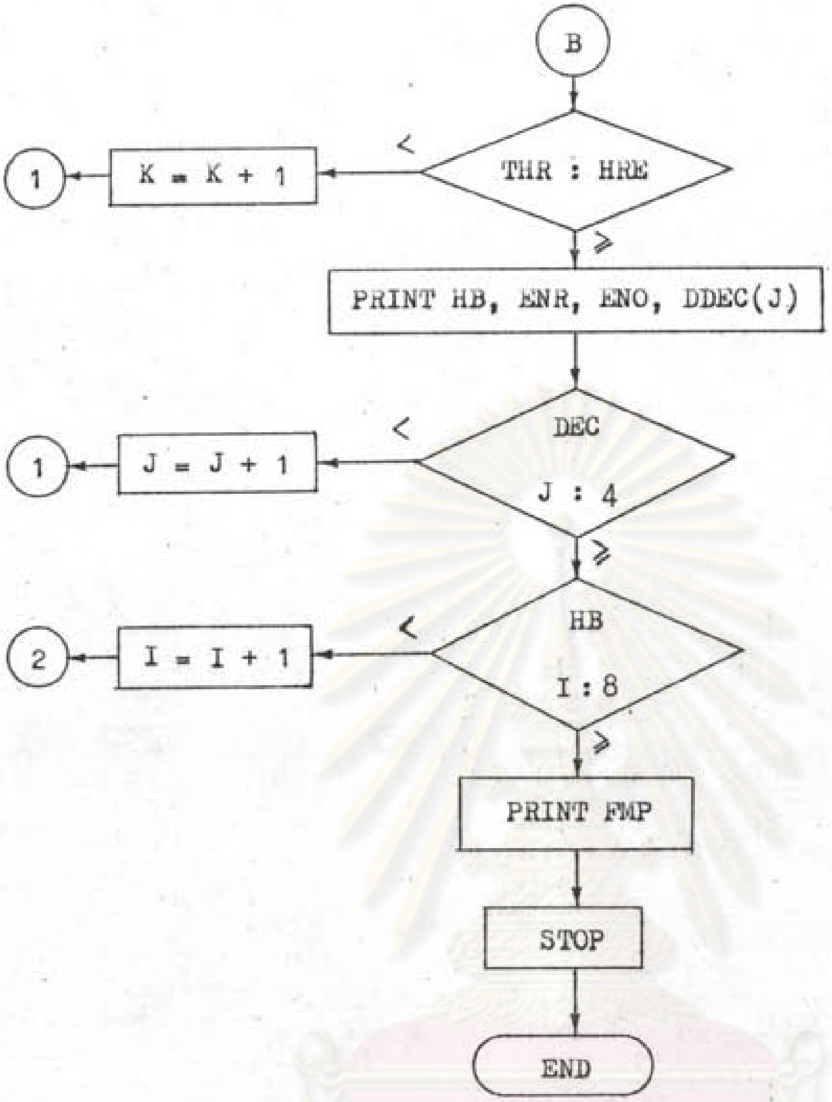
B
SRD : APR
>
≤
CAL. SOLAR ENERGY INTO RECEIVER (EN)
ENI = ENI + EN
THR : HRE
<
IH = IH + 1
1
≥
DDEC
JJ : 4
<
JJ = JJ + 1
1
≥
ENS : ENI
≥
<
ENS = ENI
TMS = DHI
DHR : HRE
<
IHR = IHR + 1
2
≥
DDEC
ID : 3
<
ID = ID + 1
2
≥
PRINT HB(I)
DDEC(ID), TMS,
ENS
C


C
3
HB
I : NH
<
≥
I = I + 1
STOP
END

MAINPROGRAM FOR ENERGY AND FLUX DISTRIBUTION ON APERTURE PLANE




A
SET OPERATING TIME
THR = HRB + CHR*(K)
SET INCREASING SIZE OF FACETS
FW, FL
SET CENTER OF EACH FACET ELEMENT
CALL HCEN, FCEN
CALL CFEM
CAL. INTERCEPT POINT AND SOLAR FLUX
FEP, SFL
MAPPING SOLAR FLUX ON MEMORIAL PLANE
CALL APM
CALL MEMP
FMP (u, v)
CAL. SOLAR ENERGY ON MEMORIAL PLANE
ENP
FEP : APR
SUM. SOLAR ENERGY INTO RECEIVER, ENR = ENR + ENP
SUM. SOLAR ENERGY OUT OF RECEIVER, ENO = ENO + ENP
B


B
THR : HRE
<
≥
K = K + 1
1
PRINT HB, ENR, ENO, DDEC(J)
DEC
J : 4
<
≥
J = J + 1
1
HB
I : 8
<
≥
I = I + 1
2
PRINT FMP
STOP
END

2. โปรแกรมที่จัดทำประกอบด้วยโปรแกรมหลัก 3 โปรแกรม
และโปรแกรมย่อยชนิดซับรูทีน 11 โปรแกรม

```
C     --------------------------------------------------------------
C     MAINPROGRAM FOR DESIGN CURVATURE OF REFLECTING SURFACES
C     --------------------------------------------------------------
      DIMENSION DDEC(4),HHB(8,3),COSP(16),ATM(4),WAT(4),BET(4)
      DOUBLE PRECISION TFR,TFN,PN,QN,RN,PHY,ZET,HTN,SB,TA,TN,TR
      COMMON /D/ DEC,ALAT,HR,PATM,WATER,BETA,RAY,SDIRT
      COMMON /E/ HL1,HL2,PHY,ZET,FW,FL,SMP,SFL
      COMMON /F/ UF(16,3),TFC(16,3),TFR(16,3),FEC(16,16,3)
      COMMON /P/ FEP(16,16,3),UPN(3),FPP(16,16,2),FMP(4,16,16),JJ
      COMMON /R/ TFN(16,3),PN(16),QN(16),RN(16)
      COMMON /T/ SB(3),TA(3),TN(3),TR(3)
      COMMON /U/ HE(3),RE(3),HB(3),CH(3),HTN(3)
      COMMON /NU/NE,NEM,NF,NPE,KF
      DATA DDEC(1),DDEC(2),DDEC(3),DDEC(4)/-23.45,0.0,23.45,0.0/
      DATA PI,CONV/3.141592654,0.017453292/
C     ALAT = LATITUDE ANGLE (DEGREES)
C     APR = RADIUS OF APERTURE
C     ALP,PHE = ANGLE FOR SET THE FACETS PLANE
C     CHR = INCREMENT OF OPERATING TIME
C     DECS= DESIGN DECLINATION FOR SETTING FACETS
C     DPS = SIZE OF ELEMENT
C     ENR = NET SOLAR ENERGY INTO RECEIVER
C     FFL = LENGTH OF FACET
C     FFW = WIDTH OF FACET
C     FMP = FLUY DISTRIBUTION ON MEMORIAL PLANE
C     FPP  = INCIDENT POINT ON APERTURE PLANE
C     GAMA = INTERCEPT ANGLE ON APERTURE PLANE
C     HB   = LOCATION OF HELIOSTAT BASE
C     HRB = BEGINNING OF OPERATING TIME
C     HRE = ENDING OF OPERATING TIME
C     HL1,HL2 = LENGTH OF HELIOSTAT FRAME
C     HTN = UNIT HELIOSTAT FRAME NORMAL VECTOR
C     KF   = KIND OF TRACKING (1=ALTAZIMUTH MOUNTING)
C     NE  = NUMBER OF FACET ELEMENT IN ROW AND COLUMN
C     NF   = NUMBER OF FACETS
C     NPE  = NUMBER OF PLANE ELEMENT IN ROW AND COLUMN
C     SMP = SIZE OF MEMORIAL PLANE
C     RE  = CENTER OF RECEIVER
C     RHO = REFLECTIVITY OF MIRROR
C     SBR = SOLAR BEAM RADIATION (W/SQ.M)
C     TMS = DESIGN TIME FOR SETTING FACETS
C     UF   = LOCATION OF THE CENTER OF FACETS
C     UPN  = APERTURE NORMAL VECTOR
      IR = 5
      IW = 6
      READ(IR,*) ALT,HL1,HL2,APR,RHO,NE,NF,KF,NH
      READ(IR,*) HRB,HRE,CHR,FFW,FFL
      READ(IR,*) RE(1),RE(2),RE(3),UPN(1),UPN(2),UPN(3)
      READ(IR,*) ((HHB(I,J),J=1,3),I=1,NH)
      READ(IR,*) ((UF(I,J),J=1,3),I=1,NF)
      READ(IR,*) (ATM(I),I=1,4)
      READ(IR,*) (WAT(I),I=1,4)
      READ(IR,*) (BET(I),I=1,4)
C
C     SET DESIGN PARAMETERS
C
C
C     SET HELIOSTATS LOCATION
C
```

```
      DO 1000 IJ=1,8
      DO 110 I=1,3
  110 HB(I) = HHE(IJ,I)
      HE(1) = HB(1)
      HE(2) = HB(2)
      HE(3) = HB(3)+HL2
      CALL AIMP
C
C     SET DESIGN HOUR ANGLE
C
      ALAT = ALT*CONV
      ENS = 0.0
      IHR = 0
      WRITE(IW,30)
   30 FORMAT('1','P.RESULTS1')
   40 DHR = HRB+CHR*FLOAT(IHR)
      HR = (DHR-12.)*15.
      IHR = IHR+1
      DO 900 IK=1,3
      DEC = DDEC(IK)*CONV
      RAY = 0.0
      CALL SUNB
      CALL NORRM
C
C     SET FACETS CENTER
C
      DO 201 I=1,3
  201 HTN(I) = TN(I)
      CALL HCEN
      DO 202 I=1,3
  202 HE(I) = CH(I)
      CALL AIMP
      CALL NORRM
      DO 203 I=1,3
  203 HTN(I) = TN(I)
      CALL HCEN
      CALL FCEN
C
C     SET CURVATURE OF EACH FACET
C
      DO 210 N=1,NF
      DO 204 I=1,3
  204 HE(I) = TFC(N,I)
      CALL AIMP
      CALL NORRM
      DO 205 I=1,3
  205 TFN(N,I) = TN(I)
  210 CONTINUE
      CALL CURF
C
C     SET DECLINATION AND OPERATING TIME
C
      ENI = 0.0
      RAY = 1.0
      DO 300 JJ=1,4
      DEC = DDEC(JJ)*CONV
      IH = 0
   50 THR = HRB+CHR*FLOAT(IH)
      HR  = (THR-12.)*15.
      PATM = ATM(JJ)
```

```
      WATER = WAT(JJ)
      BETA = BET(JJ)
      CALL SUNB
      IH = IH+1
      HE(1) = HB(1)
      HE(2) = HB(2)
      HE(3) = HB(3)+HL2
      CALL AIMP
      CALL NORRM
      DO 301 I=1,3
  301 HTN(I) = TN(I)
C
      CALL HCEN
      DO 302 I=1,3
  302 HE(I) = CH(I)
      CALL AIMP
      CALL NORRM
      DO 303 I=1,3
  303 HTN(I) = TN(I)
      CALL HCEN
      CALL FCEN
C
C     SET INCREASING SIZE OF EACH FACET
C
      DDT = (RE(1)-CH(1))**2+(RE(2)-CH(2))**2+(RE(3)-CH(3))**2
      DT  = SQRT(DDT)
      FW  = FFW+0.0093*DT
      FL  = FFL+0.0093*DT
C
C     CALCULATE  INTERCEPT POINT
C
      A12 = -HTN(3)*COS(PHY)
      A22 = -HTN(3)*SIN(PHY)
      A32 = HTN(2)*SIN(PHY)+HTN(1)*COS(PHY)
      DO 400 L=1,NF
      TN(1) = -SIN(PHY)*PN(L)+A12*QN(L)+HTN(1)*RN(L)
      TN(2) = COS(PHY)*PN(L)+A22*QN(L)+HTN(2)*RN(L)
      TN(3) = A32*QN(L)+HTN(3)*RN(L)
      CALL CRR
      COSP(L) = TR(1)*TN(1)+TR(2)*TN(2)+TR(3)*TN(3)
      DO 401 I=1,3
      TFN(L,I) = TN(I)
  401 TFR(L,I)= TR(I)
  400 CONTINUE
C
C     SET CENTER OF EACH FACET ELEMENT
C
      CALL CFEM
C
      NEM = NE*NE
      DP = UPN(1)*RE(1)+UPN(2)*RE(2)+UPN(3)*RE(3)
      AEM = FFW*FFL/FLOAT(NEM)
      DO 402 N=1,NF
      AL1 = TFR(N,1)*UPN(1)+TFR(N,2)*UPN(2)+TFR(N,3)*UPN(3)
      DO 403 L=1,NEM
      AL2 = DP-FEC(N,L,1)*UPN(1)-FEC(N,L,2)*UPN(2)-FEC(N,L,3)*UPN(3)
      AL  = AL2/AL1
      DO 404 I=1,3
  404 FEP(N,L,I) = FEC(N,L,I)+TFR(N,I)*AL
  403 CONTINUE
```

```
  402 CONTINUE
C
C     CHECK INTERCEPT POINT
C
      DO 500 N=1,NF
      DO 501 L=1,NEM
      RDX  = RE(1)-FEP(N,L,1)
      RDY  = RE(2)-FEP(N,L,2)
      RDZ  = RE(3)-FEP(N,L,3)
      RD   = RDX*RDX+RDY*RDY+RDZ*RDZ
      SRD  = SQRT(RD)
      IF(SRD.GT.APR) GO TO 501
C
C     SUM. SOLAR ENERGY INTO RECEIVER
C
      ENI  = ENI+RHO*AEM*COSP(N)*SDIRT*CHR/1000.0
  501 CONTINUE
  500 CONTINUE
      IF(THR.LT.HPE) GO TO 50
  300 CONTINUE
      WRITE(IW,70) HB(1),HB(2),HB(3),DDEC(IK),DHR,ENI
   70 FORMAT( 5X,'HHB =',3(F6.2,1X),2X,'DECS =',F8.2,2X,'TIMS =',F7.2
     .,2X,'ENERGY =',F10.2)
      IF(ENS.GE.ENI) GO TO 900
      ENS  = ENI
      TMS  = DHR
      DECL  = DDEC(IK)
  900 CONTINUE
      IF(DHR.LT.HPE) GO TO 40
      WRITE(IW,80)HB(1),HB(2),HB(3),DECL,TMS,ENS
   80 FORMAT(/5X,'HELIOSTAT BASE LOCATION AT',5X,'=',F8.2,',',F6.2,',',F
     .6.2//10X,'DESIGN DEC. FOR SETTING FACETS =',F8.2//10X,'DESIGN TIME
     . FOR SETTING FACETS =',F8.2//10X,'NET ENERGY INTO RECEIVER =',F10.
     .2//)
C
 1000 CONTINUE
      STOP
      END
```

```
J1D2SOL(1).MAINS2
C     ---------------------------------------------------------------
C      MAINPROGRAM FOR ENERGY AND FLUX DISTRIBUTION ON APERTURE PLANE
C     ---------------------------------------------------------------
      DIMENSION HHB(8,3),DECS(8),TMS(8),DDEC(4),COSG(16),COSP(16),ATM(4)
     .,WAT(4),BET(4),ND(12)
      DOUBLE PRECISION TFR,TFN,PN,QN,RN,PHY,ZET,HTN,SB,TA,TN,TR
      COMMON /D/DEC,ALAT,HR,PATM,WATER,BETA,RAY,SDIRT
      COMMON /E/ HL1,HL2,PHY,ZET,FW,FL,SMP,SFL
      COMMON /F/ UF(16,3),TFC(16,3),TFR(16,3),FEC(16,16,3)
      COMMON /P/ FEP(16,16,3),UPN(3),FPP(16,16,2),FMP(4,16,16),JJ
      COMMON /R/ TFN(16,3),PN(16),QN(16),RN(16)
      COMMON /T/ SB(3),TA(3),TN(3),TR(3)
      COMMON /U/ HE(3),RE(3),HB(3),CH(3),HTN(3)
      COMMON /NU/NE,NEM,NF,NPE,KF
      DATA PI,CONV/3.141592654,0.017453292/
      DATA DDEC/-23.45,0.0,23.45,0.0/
      DATA ND/' DE','CEM','BER','MAR','CH ','   ','JUN','E  ','   ','SEP
     .','TEM','BER'/
C
      IR = 5
      IW = 6
      READ(IR,*) ALT,HL1,HL2,APR,RHO,NE,NF,KF,NCUR,NPE,NH
      READ(IR,*) RE(1),RE(2),RE(3),UPN(1),UPN(2),UPN(3)
      READ(IR,*) HRB,HRE,CHR,FFW,FFL,SMP
      READ(IR,*) ((HHB(I,J),J=1,3),I=1,NH)
      READ(IR,*) (DECS(I),I=1,NH)
      READ(IR,*) (TMS(I),I=1,NH)
      READ(IR,*) ((UF(I,J),J=1,3),I=1,NF)
      READ(IR,*) ATM(1),ATM(2),ATM(3),ATM(4)
      READ(IR,*) WAT(1),WAT(2),WAT(3),WAT(4)
      READ(IR,*) BET(1),BET(2),BET(3),BET(4)
C
C      SET DESIGN PARAMETERS
C
      ENR = 0.0
      ALAT= ALT*CONV
      DO 100 NI=1,4
      DO 100 I=1,16
      DO 100 J=1,16
      FMP(NI,I,J) = 0.0
  100 CONTINUE
C
C      SET HELIOSTATS LOCATION
C
      DO 1000 IJ=1,NH
      DO 110 I=1,3
  110 HB(I) = HHB(IJ,I)
      HE(1) = HB(1)
      HE(2) = HB(2)
      HE(3) = HB(3)+HL2
      CALL AIMP
C
C      SET CURVATURE OF EACH FACET
C
      IF(NCUR.NE.1) GO TO 40
      HR = (TMS(IJ)-12.)*15.
      DEC= DECS(IJ)*CONV
      RAY = 0.0
      CALL SUNB
```

```
      CALL NORRM
      DO 201 I=1,3
  201 HTN(I) = TN(I)
      CALL HCEN
      DO 202 I=1,3
  202 HE(I) = CH(I)
      CALL AIMP
      CALL NORRM
      DO 203 I=1,3
  203 HTN(I) = TN(I)
      CALL HCEN
      CALL FCEN
      DO 210 N=1,NF
      DO 204 I=1,3
  204 HE(I) = TFC(N,I)
      CALL AIMP
      CALL NORRM
      DO 205 I=1,3
  205 TFN(N,I) = TN(I)
  210 CONTINUE
      CALL CURF
   40 CONTINUE
C
C     SET DECLINATION AND OPERATING TIME
C
      DO 300 JJ=1,4
      DEC = DDEC(JJ)*CONV
      IH = 0
      ENH = 0.0
      END = 0.0
   50 THR = HRB+CHR*FLOAT(IH)
      HR  = (THR-12.)*15.
      RAY = 1.0
      PATM = ATM(JJ)
      WATER = WAT(JJ)
      BETA = BET(JJ)
      CALL SUN3
      IH = IH+1
      HE(1) = HB(1)
      HE(2) = HB(2)
      HE(3) = HB(3)+HL2
      CALL AIMP
      CALL NORRM
      DO 301 I=1,3
  301 HTN(I) = TN(I)
      CALL HCEN
      DO 302 I=1,3
  302 HE(I) = CH(I)
      CALL AIMP
      CALL NORRM
      DO 303 I=1,3
  303 HTN(I) = TN(I)
      CALL HCEN
      CALL FCEN
C
C     SET INCREASING SIZE OF EACH FACET
C
      DDT = (RE(1)-CH(1))**2+(RE(2)-CH(2))**2+(RE(3)-CH(3))**2
      DT  = SQRT(DDT)
      FN  = FFN+0.0093*DT
```

```
      FL   = FFL+0.0093*DT
C
C     CALCULATE  INTERCEPT POINT
C
      A12 = -HTN(3)*COS(PHY)
      A22 = -HTN(3)*SIN(PHY)
      A32 = HTN(2)*SIN(PHY)+HTN(1)*COS(PHY)
      DO 400 L=1,NF
      IF(NCUR.NE.1)GO TO 60
      TN(1) = -SIN(PHY)*PN(L)+A12*QN(L)+HTN(1)*RN(L)
      TN(2) = COS(PHY)*PN(L)+A22*QN(L)+HTN(2)*RN(L)
      TN(3) = A32*QN(L)+HTN(3)*RN(L)
      GO TO 65
   60 CONTINUE
      DO 410 I=1,3
  410 TN(I) = HTN(I)
   65 CONTINUE
      CALL CRR
      COSP(L) = TR(1)*TN(1)+TR(2)*TN(2)+TR(3)*TN(3)
      COSG(L) =-TR(1)*UPN(1)-TR(2)*UPN(2)-TR(3)*UPN(3)
      DO 401 I=1,3
      TFN(L,I) = TN(I)
  401 TFR(L,I)= TR(I)
  400 CONTINUE
      NEM = NE*NE
C
C     SET CENTER OF EACH FACET ELEMENT
C
      CALL CFEM
C
      DP = UPN(1)*RE(1)+UPN(2)*RE(2)+UPN(3)*RE(3)
      DO 402 N=1,NF
      AL1 = TFR(N,1)*UPN(1)+TFR(N,2)*UPN(2)+TFR(N,3)*UPN(3)
      DO 403 L=1,NEM
      AL2 = DP-FEC(N,L,1)*UPN(1)-FEC(N,L,2)*UPN(2)-FEC(N,L,3)*UPN(3)
      AL  = AL2/AL1
      DO 404 I=1,3
  404 FEP(N,L,I) = FEC(N,L,I)+TFR(N,I)*AL
  403 CONTINUE
  402 CONTINUE
C
C     CALCULATE SOLAR FLUX AND SOLAR ENERGY ON APERTURE PLANE
C
      EAP =SMP/FLOAT(NPE)
      AEM = FFW*FFL/FLOAT(NEM)
      DO 500 N=1,NF
      ENP = RHO*SDIRT*COSP(N)*AEM*CHR/1000.0
      SFL = ENP*COSG(N)/(EAP*EAP)
      DO 501 L=1,NEM
C
C     MAPPING SOLAR FLUX ON MEMORIAL PLANE
C
      IF(HR.NE.0.0)GO TO 69
      CALL APM
      CALL MEMP
C
C     CHECK INTERCEPT POINT
C
   69 RDX = RE(1)-FEP(N,L,1)
      RDY = RE(2)-FEP(N,L,2)
```

```
      RDZ = RE(3)-FEP(N,L,3)
      RD  = RDX*RDX+RDY*RDY+RDZ*RDZ
      SRD = SQRT(RD)
      IF(SRD.GT.APR) GO TO 70
C
C     SUM. SOLAR ENERGY INTO RECEIVER
C
      ENR = ENR+ENP
      ENH = ENH+ENP
      GO TO 501
C
C     SUM. SOLAR ENERGY OUT OF RECEIVER
C
   70 ENO = ENO+ENP
  501 CONTINUE
  500 CONTINUE
      IF(THR.LT.HRE) GO TO 50
      NJ = JJ+(JJ-1)*2
      NK = NJ+1
      NKK = NJ+2
      WRITE(6,75) HB(1),HB(2),HB(3),ND(NJ),ND(NK),ND(NKK),ENH,ENO
   75 FORMAT(5X,'HELIOSTAT BASE LOCATION AT(',F6.2,',',F6.2,',',F6.2,')'
     *//5X,'OPERATING AT THE',15X,'21,',3A3//5X,'SUM. OF SOLAR ENERGY IN
     *TO RECEIVER =',F10.2//5X,'SUM. OF SOLAR ENERGY OUT OF RECEIVER =',
     *F10.2//)
  300 CONTINUE
 1000 CONTINUE
      WRITE(6,80) ENR
   80 FORMAT(10X,'TOTAL SOLAR ENERGY INTO RECEIVER =',F10.2//)
      DO 700 N=1,12,3
      N1 = N+1
      N2 = N+2
      N3 = N2/3
      WRITE(IW,84)SMP,SMP
   84 FORMAT('1',10X,'SOLAR FLUX DISTRIBUTION ON APERTURE PLANE ',F 3.0,
     .'X',F3.0,2X,'M. IN KW/SQ.M.'//)
      WRITE(IW,85) ND(N),ND(N1),ND(N2)
   85 FORMAT(10X,'OPERATING AT THE NOON OF THE    21,',3A3/)
      IL = NPE+1
      DO 600 J=1,NPE
      K = IL-J
      WRITE(IW,86) (FMP(N3,I,K),I=1,NPE)
   86 FORMAT (/,2X,12(F9.2,1X))
  600 CONTINUE
  700 CONTINUE
      STOP
      END
```

```
C     ------------------------------------------
C      MAINPROGRAM FOR CALCULATING INCIDENT ANGLES
C     ------------------------------------------
      DIMENSION DDEC(3),HHB(8,3),ANG(8,3,17)
      DOUBLE PRECISION HTN,SB,TA,TN,TR
      COMMON /D/ DEC,ALAT,HR,PATM,WATER,BETA,RAY,SDIRT
      COMMON /T/ SB(3),TA(3),TN(3),TR(3)
      COMMON /U/ HE(3),RE(3),HB(3),CH(3),HTN(3)
      DATA CONV/0.017453292/
      DATA RAY,PATM,WATER,BETA/0.,0.,0.,0./
C
      IR = 5
      IW = 6
      READ(IR,*)ALT,HL1,HL2,HRB,HRE,CHR,NH
      READ(IR,*) RE(1),RE(2),RE(3),DDEC(1),DDEC(2),DDEC(3)
      READ(IR,*) ((HHB(I,J),J=1,3),I=1,NH)
C
C      SET HELIOSTATS LOCATION
C
      DO 100 I=1,8
      DO 200 J=1,3
  200 HB(J) = HHB(I,J)
      HE(1) = HB(1)
      HE(2) = HB(2)
      HE(3) = HB(3)+HL2
      CALL AIMP
C
C      SET DECLINATION AND OPERATING TIME
C
      DO 300 II=1,3
      DEC = DDEC(II)*CONV
      ALAT = ALT*CONV
      IH = 0
   50 THR = HRB+CHR*FLOAT(IH)
      HR   = (THR-12.)*15.
      CALL SUNB
      IH   = IH+1
      CALL NORRM
      DG   = TN(1)*SB(1)+TN(2)*SB(2)+TN(3)*SB(3)
      ADG = ACOS(DG)
      ANG(I,II,IH) = ADG/CONV
      IF(THR.LT.HRE) GO TO 50
  300 CONTINUE
      WRITE(6,25)
   25 FORMAT(1H1,4X,70(1H-)/8X,'HELIOSTATS LOCATION',5X,'DECLINATION',5X
     .,'TIME',5X,'INCIDENT ANGLES'/13X,'(X/Y/Z)',14X,'(DEGREE)'5X,'(HOUR
     .)',7X,'(DEGREE)'/5X,70(1H-)/)
      DO 400 IJ=1,3
      TMS = (HRE-HRB)/CHR+1.
      IM = IFIX(TMS)
      DO 400 IK=1,IM
      IA = IK-1
      TH = HRB+CHR*FLOAT(IA)
      WRITE(IW,40)HHB(I,1),HHB(I,2),HHB(I,3),DDEC(IJ),TH,ANG(I,IJ,IK)
   40 FORMAT(7X,F7.2,'/',F7.2,'/',F5.2,6X,F6.2,8X,F5.2,8X,F6.2)
  400 CONTINUE
  100 CONTINUE
      STOP
      END
```

P.SUBI
*01/27/84-19:34(,0)

```
C       SUBROUTINE FOR SOLAR POSITION
        SUBROUTINE SUNP
        COMMON /D/DEC,ALAT,HR,PATM,WATER,BETA,RAY,SDIRT
        COMMON /T/SB(3),TA(3),TN(3),TR(3)
        DATA PI,CONV/3.141592654,0.017453292/
C
        HR   = HR*CONV
        A    = COS(ALAT)*COS(DEC)*COS(HR)+SIN(ALAT)*SIN(DEC)
        ZETA = 0.
        IF(ABS(A).LT.1.) GO TO 1
        IF(A.GE.1.) ALPHA = PI/2.
        IF(A.LE.-1.) ALPHA = -PI/2.
        GO TO 5
      1 ALPHA = ASIN(A)
        C = (SIN(ALAT)*COS(DEC)*COS(HR)-COS(ALAT)*SIN(DEC))/COS(ALPHA)
        S = COS(DEC)*SIN(HR)/COS(ALPHA)
        IF(ABS(C).GE.0.7071) GO TO 2
        ZETA = ACOS(C)
        IF(S.LT.0.)ZETA = -ZETA
        GO TO 5
      2 IF(C.LT.0.) GO TO 3
        ZETA = ASIN(S)
        GO TO 5
      3 IF(S.GT.0.) GO TO 4
        ZETA = -(PI-ASIN(S))
        GO TO 5
      4 ZETA = PI-ASIN(S)
      5 SB(1)= -COS(ALPHA)*SIN(ZETA)
        SB(2)= -COS(ALPHA)*COS(ZETA)
        SB(3)=  SIN(ALPHA)
        IF(RAY.LE.0.0) GO TO 10
        AIRM = PATM/(1000.0*A)
        TRP  = (ALPHA/CONV+05)/(39.5*EXP(-WATER)+47.4)
        TURB = TRP+(16.+.22*WATER)*BETA+0.1
        SDIR = 1353.0*(1.0-SIN(DEC)/11.5)
        SDIRT = SDIR*EXP(-AIRM*TURB/(5.6*SQRT(AIRM+5.)-3.7))
     10 CONTINUE
        RETURN
        END
```

IPL IBANK 91 DBANK 20 COMMON

```
ISE P.SUB2
?1   *01/27/84-19:34(,0)
      C       SUBROUTINE FOR THE CENTRAL REFLECTED RAY
              SUBROUTINE CRR
              COMMON /T/SB(3),TA(3),TN(3),TR(3)
      C
              DOTV = TN(1)*SB(1)+TN(2)*SB(2)+TN(3)*SB(3)
              TR(1)= 2.*DOTV*TN(1)-SB(1)
              TR(2)= 2.*DOTV*TN(2)-SB(2)
              TR(3)= 2.*DOTV*TN(3)-SB(3)
              RETURN
              END

EN 27 IBANK 5 DBANK 12 COMMON
```

```
ISE P.SUB3
?1   *01/27/84-19:34(,0)
      C       SUBROUTINE FOR TOWER VECTOR
              SUBROUTINE AIMF
              COMMON /T/SB(3),TA(3),TN(3),TR(3)
              COMMON /U/HE(3),RE(3),HB(3),CH(3),HTN(3)
      C
              SDX = RE(1)-HE(1)
              SDY = RE(2)-HE(2)
              SDZ = RE(3)-HE(3)
              DS  = SQRT(SDX*SDX+SDY*SDY+SDZ*SDZ)
              TA(1) = SDX/DS
              TA(2) = SDY/DS
              TA(3) = SDZ/DS
              RETURN
              END

EN 35 IBANK 13 DBANK 27 COMMON
```

```
ISE P.SUB4
?1   *01/27/84-19:34(,0)
      C       SUBROUTINE FOR MIRROR NORMAL VECTOR
              SUBROUTINE NORRM
              COMMON /T/SB(3),TA(3),TN(3),TR(3)
      C
              SX = TA(1)+SB(1)
              SY = TA(2)+SB(2)
              SZ = TA(3)+SB(3)
              SUMD = SQRT(SX*SX+SY*SY+SZ*SZ)
              TN(1)= SX/SUMD
              TN(2)= SY/SUMD
              TN(3)= SZ/SUMD
              RETURN
              END

EN 35 IBANK 13 DBANK 12 COMMON
```

```
ISE P.SUB5
?1   *01/27/84-19:34(,0)
      C        SUBROUTINE FOR CROSS PRODUCT (UPC = UPA*UPB)
               SUBROUTINE CROSP
               COMMON /H/UPA(3),UPB(3),UPC(3)
      C
               AP = UPA(2)*UPB(3)-UPA(3)*UPB(2)
               BP = UPA(3)*UPB(1)-UPA(1)*UPB(3)
               CP = UPA(1)*UPB(2)-UPA(2)*UPB(1)
               DP = SQRT(AP*AP+BP*BP+CP*CP)
               UPC(1) = AP/DP
               UPC(2) = BP/DP
               UPC(3) = CP/DP
               RETURN
               END

IN 46 IBANK 15 DBANK 9 COMMON
```

```
ISE P.SUB6
?1   *01/27/84-19:34(,0)
      C        SUBROUTINE FOR HELIOSTAT CENTER
      C
               SUBROUTINE HCEN
      C
               COMMON /E/HL1,HL2,PHY,ZET,FW,FL,SMP,SFL
               COMMON /T/SB(3),TA(3),TN(3),TR(3)
               COMMON /U/HB(3),RE(3),HR(3),CH(3),HTN(3)
               DATA PI/3.141592654/
      C
               IF(HTN(1).EQ.0.) GO TO 10
               PHY = ATAN(HTN(2)/HTN(1))
               IF(HTN(1).LT.0.) PHY = PHY+PI
               GO TO 30
            10 CONTINUE
               IF(HTN(2)-0.) 15,20,25
            15 PHY = -PI/2.
               GO TO 30
            20 PHY =  0.0
               GO TO 30
            25 PHY =  PI/2.
            30 SDN = SQRT(HTN(1)*HTN(1)+HTN(2)*HTN(2))
               IF(SDN.EQ.0.0) GO TO 40
            35 ZET = ATAN(HTN(3)/SDN)
               GO TO 45
            40 ZET = PI/2.
            45 CH(1) = HB(1)+HL1*COS(ZET)*COS(PHY)
               CH(2) = HB(2)+HL1*COS(ZET)*SIN(PHY)
               CH(3) = HB(3)+HL2+HL1*SIN(ZET)
               RETURN
               END

IN 61 IBANK 25 DBANK 35 COMMON
```

```
P.SUB7
*01/27/84-19:34(,0)
      C
      C       SUBROUTINE FOR FACETS CENTER
      C
              SUBROUTINE FCEN
      C
              COMMON /E/HL1,HL2,PHY,ZET,FW,FL,SMP,SFL
              COMMON /F/ UF(16,3),TFC(16,3),TFR(16,3),FEC(16,16,3)
              COMMON /U/HE(3),RE(3),HB(3),CH(3),HTN(3)
              COMMON /NU/NE,NEM,NF,NPE,KF
      C
              DO 100 I=1,NF
              TFC(I,1) = CH(1)-UF(I,1)*SIN(PHY)-UF(I,2)*HTN(3)*COS(PHY)+UF(I,3)
             :HTN(1)
              TFC(I,2) = CH(2)+UF(I,1)*COS(PHY)-UF(I,2)*HTN(3)*SIN(PHY)+UF(I,3)
             :HTN(2)
              TFC(I,3) = CH(3)+UF(I,2)*(HTN(2)*SIN(PHY)+HTN(1)*COS(PHY))+UF(I,3
             .*HTN(3)
          100 CONTINUE
              RETURN
              END

B7 IBANK 22 DBANK 940 COMMON
```

```
P.SUB8
*01/27/84-19:34(,0)
      C       SUBROUTINE FOR SETTING CURVATURE OF FACETS
      C
              SUBROUTINE CURF
      C
              COMMON /E/ HL1,HL2,PHY,ZET,FW,FL,SMP,SFL
              COMMON /R/ TFN(16,3),PN(16),QN(16),RN(16)
              COMMON /U/HE(3),RE(3),HB(3),CH(3),HTN(3)
              COMMON /NU/NE,NEM,NF,NPE,KF
              A =HTN(1)*SIN(PHY)-HTN(2)*COS(PHY)
              AA = HTN(1)*COS(PHY)+HTN(2)*SIN(PHY)
              BB = AA*AA
              DO 100 I=1,NF
              B = TFN(I,2)*HTN(1)-TFN(I,1)*HTN(2)
              CC = TFN(I,1)*COS(PHY)+TFN(I,2)*SIN(PHY)
              RN(I) = (AA*CC+TFN(I,3)*HTN(3))/(HTN(3)*HTN(3)+BB)
              QN(I) = (TFN(I,3)*AA-HTN(3)*CC)/(HTN(3)*HTN(3)+BB)
              IF(AA.EQ.0.0) GO TO 10
              PN(I) = (B+HTN(3)*A*QN(I))/AA
              GO TO 100
           10 PN(I) = 0.0
          100 CONTINUE
              RETURN
              END

B8 IBANK 27 DBANK 124 COMMON
```

```
ISE P.SUB9
RI   *01/27/84-19:34(,0)
C
C       SUBROUTINE FOR CENTER OF FACET ELEMENTS
C
        SUBROUTINE CFEM
        DIMENSION EVX(3),EVY(3),EB(3),EH(3)
        COMMON /E/HL1,HL2,PHY,SET,FW,FL,SMP,SFL
        COMMON /F/ UF(16,3),TFC(16,3),TFR(16,3),FEC(16,16,3)
        COMMON /H/UPA(3),UPB(3),UPC(3)
        COMMON /R/ TFN(16,3),PN(16),QN(16),RN(16)
        COMMON /NU/NE,NEM,NF,NPE,KF
C
        DFL = FL/FLOAT(NE)
        DFW = FW/FLOAT(NE)
C       FIND UNIT VECTOR EVX(I)
        DO 100 N=1,NF
        NME = 0.0
        DO 101 L=1,3
        UPA(L) = TFR(N,L)
    101 UPB(L) = TFN(N,L)
        CALL CROSP
        DO 102 L=1,3
    102 EVX(L) = UPC(L)
C       FIND UNIT VECTOR EVY(I)
        DO 103 L=1,3
        UPA(L) = TFN(N,L)
    103 UPB(L) = EVX(L)
        CALL CROSP
        DO 104 L=1,3
    104 EVY(L) = UPC(L)
        IF(KF.NE.1) GO TO 50
        IF(TFN(N,3).EQ.0.0) GO TO 40
        DN   = SQRT(TFN(N,1)*TFN(N,1)+TFN(N,2)*TFN(N,2))
        EH(1) = TFN(N,1)/DN
        EH(2) = TFN(N,2)/DN
        EH(3) = 0.0
        GO TO 45
     40 EH(1) = 0.0
        EH(2) = 0.0
        EH(3) = 1.0
     45 CONTINUE
        DO 105 J=1,3
        UPA(J) = EH(J)
    105 UPB(J) = TFN(N,J)
        CALL CROSP
        DO 106 J=1,3
    106 EB(J) = UPC(J)
        CDOT  = EB(1)*EVX(1)+EB(2)*EVX(2)+EB(3)*EVX(3)
        DDOT  = EB(1)*EVY(1)+EB(2)*EVY(2)+EB(3)*EVY(3)
        BTA   = ABS(CDOT)
        BETA  = ACOS(BTA)
        IF(DDOT.GT.0.0) BETA = -BETA
        GO TO 60
     50 BETA = 0.0
     60 CONTINUE
        DO 203 K=1,NE
        VY = DFW*FLOAT(K)-(FW+DFW)/2.
        DO 201 L=1,NE
        VX = DFL*FLOAT(L)-(FL+DFL)/2.
```

```
      NME = NME+1
      VA  = VX*COS(BETA)+VY*SIN(BETA)
      VB  = -VX*SIN(BETA)+VY*COS(BETA)
      FEC(N,NME,1)=TFC(N,1)+VA*EVX(1)+VB*EVY(1)
      FEC(N,NME,2)=TFC(N,2)+VA*EVX(2)+VB*EVY(2)
      FEC(N,NME,3)=TFC(N,3)+VA*EVX(3)+VB*EVY(3)
  201 CONTINUE
  200 CONTINUE
  100 CONTINUE
      RETURN
      END

TN 259 IBANK 65 DBANK 1033 COMMON
```

```
P.SUB10
*01/27/84-19:34(,D)
C       SUBROUTINE APERTURE PLANE MAPPING
        SUBROUTINE APM
        DIMENSION  UEQ(3),UER(3)
        COMMON /P/ FEP(16,16,3),UPN(3),FPP(16,16,2),FMP(4,16,16),JJ
        COMMON /U/ HE(3),RE(3),HB(3),CH(3),HTN(3)
        COMMON /NU/NE,NEM,NF,NPF,KF
C
        IF(UPN(1).EQ.0.0.AND.UPN(2).EQ.0.0) GO TO 10
C       SET UNIT VECTOR UEQ(I) AND UER(I)
        AE = UPN(2)*UPN(3)
        BE = -UPN(1)*UPN(3)
        DE = SQRT(AE*AE+BE*BE)
        UEQ(1) = AE/DE
        UEQ(2) = BE/DE
        UEQ(3) = 0.0
        AER =  UPN(1)*UPN(3)*UPN(3)
        BER =  UPN(2)*UPN(3)*UPN(3)
        CER =  -UPN(3)*(UPN(1)*UPN(1)+UPN(2)*UPN(2))
        DER =  SQRT(AER*AER+BER*BER+CER*CER)
        UER(1) = AER/DER
        UER(2) = BER/DER
        UER(3) = CER/DER
        GO TO 20
C
     10 UEQ(1) = -1.0
        UEQ(2) = 0.0
        UEQ(3) = 0.0
        UER(1) = 0.0
        UER(2) = 1.0
        UER(3) = 0.0
C
     20 CONTINUE
C       SET POSION VECTOR OF RECEIVER
        DR = SQRT(RE(1)*RE(1)+RE(2)*RE(2)+RE(3)*RE(3))
        DR1 = RE(1)/DR
        DR2 = RE(2)/DR
        DR3 = RE(3)/DR
        DZ = ABS(DR1*UPN(1)+DR2*UPN(2)+DR3*UPN(3))
        ZTA = ACOS(DZ)
C
        RCO = -DR*SIN(ZTA)
        DO 200 I=1,NF
        DO 200 J=1,NEM
        FPP(I,J,1) = UEQ(1)*FEP(I,J,1)+UEQ(2)*FEP(I,J,2)+UEQ(3)*FEP(I,J,3
        FPP(I,J,2) = RCO+UER(1)*FEP(I,J,1)+UER(2)*FEP(I,J,2)+UER(3)*FEP(I
       .J,3)
    200 CONTINUE
        RETURN
        END

1P6 IBANK 49 DBANK 2328 COMMON
```

```
ISE P.SUB11
RI  *01/27/84-19:34(,0)
      C
      C         SUBROUTINE FOR MEMORIAL PLANE
      C
                SUBROUTINE MEMP
      C
                COMMON /E/HL1,HL2,PHY,ZFT,FW,FL,SMP,SFL
                COMMON /P/ FEP(16,16,3),UPN(3),FPP(16,16,2),FMP(4,16,16),JJ
                COMMON /NU/NE,NEM,NF,NPE,KF
      C
                DPS = SMP/FLOAT(NPE)
      C
                DO 100 I=1,NF
                DO 100 J=1,NEM
                PPX = FPP(I,J,1)+SMP/2.
                PPY = FPP(I,J,2)+SMP/2.
                AXX = 0.0
                AYY = 0.0
                DO 200 II=1,NPE
                AY   = DPS*FLOAT(II)
                IF(PPY.GE.AYY.AND.PPY.LT.AY) IY = II
                AYY = AY
                DO 200 JK=1,NPE
                AX   = DPS*FLOAT(JK)
                IF(PPX.GE.AXX.AND.PPX.LT.AX) IX = JK
                AXX = AX
            200 CONTINUE
                FMP(JJ,IX,IY) = FMP(JJ,IX,IY)+SFL
            100 CONTINUE
                RETURN
                END

IN 119 IBANK 31 DBANK 2321 COMMON
```

ภาคผนวก ข.

การจัดบัตรข้อมูลและผลการจัดทำโปรแกรม

<u>การจัดส่วน</u>

ภาคผนวกนี้แบ่งออกเป็น 2 ส่วนคือ

ก. การจัดบัตรข้อมูลที่ใช้กับโปรแกรมทั้ง 3 โดยเรียงตามลำดับดังนี้

1. บัตรข้อมูลที่ใช้กับโปรแกรมหารูปทรงของผิวสะท้อนแสงคือ DATAS 1 ใช้บัตรข้อมูล 12 ใบ
2. บัตรข้อมูลที่ใช้กับโปรแกรมหาปริมาณพลังงานและค่าการแจกแจงความเข้มของรังสีมี 2 ชุด คือ DATAS 2 และ DATAS 4 ใช้บัตรข้อมูลชุดละ 14 ใบ
3. บัตรข้อมูลที่ใช้กับโปรแกรมหามุมรังสีตกกระทบคือ DATAS 3 ใช้บัตรข้อมูล 4 ใบ

ข. ผลที่ได้จากโปรแกรมทั้ง 3 ได้จัดเรียงตามลำดับดังนี้

1. ผลจากโปรแกรมหามุมรังสีตกกระทบ
2. ผลจากโปรแกรมหารูปทรงของผิวสะท้อนแสง
3. ผลจากโปรแกรมหาปริมาณพลังงานและค่าการแจกแจงความเข้มของรังสี

ตัวอย่างบัตรข้อมูลที่ใช้กับโปรแกรมต่าง ๆ

P.DATAS1

```
13.74 0.30 3.20 1.75 0.9 3 16 1 8/
8.00 16.00 1.00 1.50 1.50/
0.0 0.0 32.0 0.0 0.173648 -0.9848/
0.0 -30.0 0.0 21.21 -21.21 0.0 30.0 0.0 0.0 21.21 21.21 0.0 0.0 30.0 0.0 -21.21
 21.21 0.0 -30.0 0.0 0.0 -21.21 -21.21 0.0/
-2.28 2.28 0.02 -0.76 2.28 0.02 0.76 2.28 0.02 2.28 2.28 0.02 -2.28 0.76 0.02
-0.76 0.76 0.02 0.76 0.76 0.02 2.28 0.76 0.02 -2.28 -0.76 0.02 -0.76 -0.76 0.02
 0.76 -0.76 0.02 2.28 -0.76 0.02 -2.28 -2.28 0.02 -0.76 -2.28 0.02 0.76 -2.28
0.02 2.28 -2.28 0.02/
1010.48 1006.19 1007.35 1012.13/
4.63 5.56 5.41 3.92/
0.10 0.12 0.09 0.09/
```

P.DATAS2

```
13.74 0.3 3.20 1.75 0.9 3 16 1 1 10 8/
0.0 0.0 32.0 0.0 0.173648 -0.9848/
8.00 16.00 1.00 1.50 1.50 10./
0.0 -30.0 0.0 21.21 -21.21 0.0 30.0 0.0 0.0 21.21 21.21 0.0 0.0 30.0 0.0 -21.21
21.21 0.0 -30.0 0.0 0.0 -21.21 -21.21 0.0/
23.45 -23.45 -23.45 -23.45 0.0 -23.45 -23.45 -23.45/
12.0 14.0 13.0 9.0 12.0 9.0 11.0 10.0/
-2.28 2.28 0.02 -0.76 2.28 0.02 0.76 2.28 0.02 2.28 2.28 0.02 -2.28 0.76 0.02
-0.76 0.76 0.02 0.76 0.76 0.02 2.28 0.76 0.02 -2.28 -0.76 0.02 -0.76 -0.76 0.02
 0.76 -0.76 0.02 2.28 -0.76 0.02 -2.28 -2.28 0.02 -0.76 -2.28 0.02 0.76 -2.28
0.02 2.28 -2.28 0.02/
1010.48 1006.19 1007.35 1012.13/
4.63 5.56 5.41 3.92/
0.10 0.12 0.09 0.09/
```

A.

P.DATAS3

```
13.74 0.30 3.20 8.00 16.00 1.00 8/
0.0 0.0 32.0 -23.45 0.0 23.45/
0.0 -30.0 0.0 21.21 -21.21 0.0 30.0 0.0 0.0 21.21 21.21 0.0 0.0 30.0 0.0 -21.21
 21.21 0.0 -30.0 0.0 0.0 -21.21 -21.21 0.0/
```

P.DATAS4

```
13.74 0.3 3.20 1.75 0.9 3 16 1 0 10 8/
0.0 0.0 32.0 0.0 0.173648 -0.9848/
8.00 16.00 1.00 1.50 1.50 10./
0.0 -30.0 0.0 21.21 -21.21 0.0 30.0 0.0 0.0 21.21 21.21 0.0 0.0 30.0 0.0 -21.21
21.21 0.0 -30.0 0.0 0.0 -21.21 -21.21 0.0/
23.45 -23.45 -23.45 -23.45 0.0 -23.45 -23.45 -23.45/
12.0 14.0 13.0 9.0 12.0 9.0 11.0 10.0/
-2.28 2.28 0.02 -0.76 2.28 0.02 0.76 2.28 0.02 2.28 2.28 0.02 -2.28 0.76 0.02
-0.76 0.76 0.02 0.76 0.76 0.02 2.28 0.76 0.02 -2.28 -0.76 0.02 -0.76 -0.76 0.02
 0.76 -0.76 0.02 2.28 -0.76 0.02 -2.28 -2.28 0.02 -0.76 -2.28 0.02 0.76 -2.28
0.02 2.28 -2.28 0.02/
1010.48 1006.19 1007.35 1012.13/
4.63 5.56 5.41 3.92/
0.10 0.12 0.09 0.09/
```

1. ผลจากโปรแกรมหามุมรังสีตกกระทบ

HELIOSTATS LOCATION (X/Y/Z)	DECLINATION (DEGREE)	TIME (HOUR)	INCIDENT ANGLES (DEGREE)
.00/ -30.00/ .00	-23.45	8.00	49.28
.00/ -30.00/ .00	-23.45	9.00	45.55
.00/ -30.00/ .00	-23.45	10.00	43.45
.00/ -30.00/ .00	-23.45	11.00	42.13
.00/ -30.00/ .00	-23.45	12.00	41.68
.00/ -30.00/ .00	-23.45	13.00	42.13
.00/ -30.00/ .00	-23.45	14.00	43.45
.00/ -30.00/ .00	-23.45	15.00	45.55
.00/ -30.00/ .00	-23.45	16.00	48.28
.00/ -30.00/ .00	.00	8.00	37.74
.00/ -30.00/ .00	.00	9.00	34.62
.00/ -30.00/ .00	.00	10.00	32.13
.00/ -30.00/ .00	.00	11.00	30.52
.00/ -30.00/ .00	.00	12.00	29.95
.00/ -30.00/ .00	.00	13.00	30.52
.00/ -30.00/ .00	.00	14.00	32.13
.00/ -30.00/ .00	.00	15.00	34.62
.00/ -30.00/ .00	.00	16.00	37.74
.00/ -30.00/ .00	23.45	8.00	27.47
.00/ -30.00/ .00	23.45	9.00	23.98
.00/ -30.00/ .00	23.45	10.00	21.02
.00/ -30.00/ .00	23.45	11.00	18.97
.00/ -30.00/ .00	23.45	12.00	18.23
.00/ -30.00/ .00	23.45	13.00	18.97
.00/ -30.00/ .00	23.45	14.00	21.02
.00/ -30.00/ .00	23.45	15.00	23.98
.00/ -30.00/ .00	23.45	16.00	27.47

HELIOSTATS LOCATION (Y/Y/Z)	DECLINATION (DEGREE)	TIME (HOUR)	INCIDENT ANGLES (DEGREE)
21.21/ -21.21/ .00	-23.45	8.00	57.25
21.21/ -21.21/ .00	-23.45	9.00	51.82
21.21/ -21.21/ .00	-23.45	10.00	46.67
21.21/ -21.21/ .00	-23.45	11.00	41.98
21.21/ -21.21/ .00	-23.45	12.00	37.96
21.21/ -21.21/ .00	-23.45	13.00	34.84
21.21/ -21.21/ .00	-23.45	14.00	32.91
21.71/ -21.21/ .00	-23.45	15.00	32.39
21.21/ -21.21/ .00	-23.45	16.00	33.35
21.21/ -21.21/ .00	.00	8.00	49.78
21.21/ -21.21/ .00	.00	9.00	44.16
21.21/ -21.21/ .00	.00	10.00	38.57
21.21/ -21.21/ .00	.00	11.00	33.19
21.21/ -21.21/ .00	.00	12.00	28.26
21.21/ -21.21/ .00	.00	13.00	24.17
21.21/ -21.21/ .00	.00	14.00	21.44
21.21/ -21.21/ .00	.00	15.00	20.67
21.21/ -21.21/ .00	.00	16.00	22.07
21.21/ -21.21/ .00	23.45	8.00	41.83
21.21/ -21.21/ .00	23.45	9.00	36.58
21.21/ -21.21/ .00	23.45	10.00	31.08
21.21/ -21.21/ .00	23.45	11.00	25.46
21.21/ -21.21/ .00	23.45	12.00	19.88
21.21/ -21.21/ .00	23.45	13.00	14.62
21.21/ -21.21/ .00	23.45	14.00	10.40
21.21/ -21.21/ .00	23.45	15.00	8.97
21.21/ -21.21/ .00	23.45	16.00	11.47

HELIOSTATS LOCATION (X/Y/Z)			DECLINATION (DEGREE)	TIME (HOUR)	INCIDENT ANGLES (DEGREE)
30.00/	.00/	.00	-23.45	8.00	54.64
30.00/	.00/	.00	-23.45	9.00	47.78
30.00/	.00/	.00	-23.45	10.00	41.03
30.00/	.00/	.00	-23.45	11.00	34.47
30.00/	.00/	.00	-23.45	12.00	28.26
30.00/	.00/	.00	-23.45	13.00	22.71
30.00/	.00/	.00	-23.45	14.00	18.44
30.00/	.00/	.00	-23.45	15.00	16.49
30.00/	.00/	.00	-23.45	16.00	17.64
30.00/	.00/	.00	.00	8.00	53.38
30.00/	.00/	.00	.00	9.00	45.99
30.00/	.00/	.00	.00	10.00	38.59
30.00/	.00/	.00	.00	11.00	31.21
30.00/	.00/	.00	.00	12.00	23.86
30.00/	.00/	.00	.00	13.00	16.61
30.00/	.00/	.00	.00	14.00	9.69
30.00/	.00/	.00	.00	15.00	4.84
30.00/	.00/	.00	.00	16.00	8.02
30.00/	.00/	.00	23.45	8.00	50.74
30.00/	.00/	.00	23.45	9.00	44.03
30.00/	.00/	.00	23.45	10.00	37.20
30.00/	.00/	.00	23.45	11.00	30.32
30.00/	.00/	.00	23.45	12.00	23.48
30.00/	.00/	.00	23.45	13.00	16.80
30.00/	.00/	.00	23.45	14.00	10.72
30.00/	.00/	.00	23.45	15.00	7.06
30.00/	.00/	.00	23.45	16.00	9.35

HELIOSTATS LOCATION (X/Y/Z)			DECLINATION (DEGREE)	TIME (HOUR)	INCIDENT ANGLES (DEGREE)
21.21/	21.21/	.00	-23.45	8.00	42.40
21.21/	21.21/	.00	-23.45	9.00	35.79
21.21/	21.21/	.00	-23.45	10.00	29.05
21.21/	21.21/	.00	-23.45	11.00	22.21
21.21/	21.21/	.00	-23.45	12.00	15.34
21.21/	21.21/	.00	-23.45	13.00	8.50
21.21/	21.21/	.00	-23.45	14.00	2.42
21.21/	21.21/	.00	-23.45	15.00	6.07
21.21/	21.21/	.00	-23.45	16.00	12.85
21.21/	21.21/	.00	.00	8.00	46.28
21.21/	21.21/	.00	.00	9.00	39.21
21.21/	21.21/	.00	.00	10.00	32.19
21.21/	21.21/	.00	.00	11.00	25.30
21.21/	21.21/	.00	.00	12.00	18.72
21.21/	21.21/	.00	.00	13.00	12.99
21.21/	21.21/	.00	.00	14.00	9.76
21.21/	21.21/	.00	.00	15.00	11.39
21.21/	21.21/	.00	.00	16.00	16.50
21.21/	21.21/	.00	23.45	8.00	49.97
21.21/	21.21/	.00	23.45	9.00	43.50
21.21/	21.21/	.00	23.45	10.00	37.31
21.21/	21.21/	.00	23.45	11.00	31.61
21.21/	21.21/	.00	23.45	12.00	26.69
21.21/	21.21/	.00	23.45	13.00	23.07
21.21/	21.21/	.00	23.45	14.00	21.43
21.21/	21.21/	.00	23.45	15.00	22.21
21.21/	21.21/	.00	23.45	16.00	25.19

HELIOSTATS LOCATION (X/Y/Z)	DECLINATION (DEGREE)	TIME (HOUR)	INCIDENT ANGLES (DEGREE)
.00/ 30.00/ .00	-23.45	8.00	26.54
.00/ 30.00/ .00	-23.45	9.00	20.23
.00/ 30.00/ .00	-23.45	10.00	13.94
.00/ 30.00/ .00	-23.45	11.00	7.99
.00/ 30.00/ .00	-23.45	12.00	4.49
.00/ 30.00/ .00	-23.45	13.00	7.99
.00/ 30.00/ .00	-23.45	14.00	13.94
.00/ 30.00/ .00	-23.45	15.00	20.23
.00/ 30.00/ .00	-23.45	16.00	26.54
.00/ 30.00/ .00	.00	8.00	32.52
.00/ 30.00/ .00	.00	9.00	26.68
.00/ 30.00/ .00	.00	10.00	21.52
.00/ 30.00/ .00	.00	11.00	17.69
.00/ 30.00/ .00	.00	12.00	16.21
.00/ 30.00/ .00	.00	13.00	17.69
.00/ 30.00/ .00	.00	14.00	21.52
.00/ 30.00/ .00	.00	15.00	26.68
.00/ 30.00/ .00	.00	16.00	32.52
.00/ 30.00/ .00	23.45	8.00	40.00
.00/ 30.00/ .00	23.45	9.00	35.24
.00/ 30.00/ .00	23.45	10.00	31.40
.00/ 30.00/ .00	23.45	11.00	28.84
.00/ 30.00/ .00	23.45	12.00	27.94
.00/ 30.00/ .00	23.45	13.00	28.84
.00/ 30.00/ .00	23.45	14.00	31.40
.00/ 30.00/ .00	23.45	15.00	35.24
.00/ 30.00/ .00	23.45	16.00	40.00

HELIOSTATS LOCATION (X/Y/Z)	DECLINATION (DEGREE)	TIME (HOUR)	INCIDENT ANGLES (DEGREE)
-21.00/ 21.21/ .00	-23.45	8.00	12.96
-21.00/ 21.21/ .00	-23.45	9.00	6.18
-21.00/ 21.21/ .00	-23.45	10.00	2.34
-21.00/ 21.21/ .00	-23.45	11.00	8.37
-21.00/ 21.21/ .00	-23.45	12.00	15.21
-21.00/ 21.21/ .00	-23.45	13.00	22.09
-21.00/ 21.21/ .00	-23.45	14.00	28.92
-21.00/ 21.21/ .00	-23.45	15.00	35.67
-21.00/ 21.21/ .00	-23.45	16.00	42.28
-21.00/ 21.21/ .00	.00	8.00	16.62
-21.00/ 21.21/ .00	.00	9.00	11.48
-21.00/ 21.21/ .00	.00	10.00	9.76
-21.00/ 21.21/ .00	.00	11.00	12.93
-21.00/ 21.21/ .00	.00	12.00	18.63
-21.00/ 21.21/ .00	.00	13.00	25.19
-21.00/ 21.21/ .00	.00	14.00	32.07
-21.00/ 21.21/ .00	.00	15.00	39.09
-21.00/ 21.21/ .00	.00	16.00	46.16
-21.00/ 21.21/ .00	23.45	8.00	25.28
-21.00/ 21.21/ .00	23.45	9.00	22.27
-21.00/ 21.21/ .00	23.45	10.00	21.45
-21.00/ 21.21/ .00	23.45	11.00	23.05
-21.00/ 21.21/ .00	23.45	12.00	26.63
-21.00/ 21.21/ .00	23.45	13.00	31.53
-21.00/ 21.21/ .00	23.45	14.00	37.22
-21.00/ 21.21/ .00	23.45	15.00	43.40
-21.00/ 21.21/ .00	23.45	16.00	49.87

HELIOSTATS LOCATION (X/Y/Z)	DECLINATION (DEGREE)	TIME (HOUR)	INCIDENT ANGLES (DEGREE)
-30.00/ .00/ .00	-23.45	8.00	17.64
-30.00/ .00/ .00	-23.45	9.00	16.40
-30.00/ .00/ .00	-23.45	10.00	18.44
-30.00/ .00/ .00	-23.45	11.00	22.71
-30.00/ .00/ .00	-23.45	12.00	28.26
-30.00/ .00/ .00	-23.45	13.00	34.47
-30.00/ .00/ .00	-23.45	14.00	41.03
-30.00/ .00/ .00	-23.45	15.00	47.78
-30.00/ .00/ .00	-23.45	16.00	54.64
-30.00/ .00/ .00	.00	8.00	8.02
-30.00/ .00/ .00	.00	9.00	4.84
-30.00/ .00/ .00	.00	10.00	9.69
-30.00/ .00/ .00	.00	11.00	16.61
-30.00/ .00/ .00	.00	12.00	23.86
-30.00/ .00/ .00	.00	13.00	31.21
-30.00/ .00/ .00	.00	14.00	38.59
-30.00/ .00/ .00	.00	15.00	45.99
-30.00/ .00/ .00	.00	16.00*	53.38
-30.00/ .00/ .00	23.45	8.00	9.35
-30.00/ .00/ .00	23.45	9.00	7.06
-30.00/ .00/ .00	23.45	10.00	10.72
-30.00/ .00/ .00	23.45	11.00	16.80
-30.00/ .00/ .00	23.45	12.00	23.48
-30.00/ .00/ .00	23.45	13.00	30.32
-30.00/ .00/ .00	23.45	14.00	37.20
-30.00/ .00/ .00	23.45	15.00	44.03
-30.00/ .00/ .00	23.45	16.00	50.74

HELIOSTATS LOCATION (X/Y/Z)	DECLINATION (DEGREE)	TIME (HOUR)	INCIDENT ANGLES (DEGFEE)
-21.21/ -21.21/ .00	-23.45	8.00	23.35
-21.21/ -21.21/ .00	-23.45	9.00	32.39
-21.21/ -21.21/ .00	-23.45	10.00	32.91
-21.21/ -21.21/ .00	-23.45	11.00	34.84
-21.21/ -21.21/ .00	-23.45	12.00	37.96
-21.21/ -21.21/ .00	-23.45	13.00	41.98
-21.21/ -21.21/ .00	-23.45	14.00	46.67
-21.21/ -21.21/ .00	-23.45	15.00	51.82
-21.21/ -21.21/ .00	-23.45	16.00	57.25
-21.21/ -21.21/ .00	.00	8.00	22.07
-21.21/ -21.21/ .00	.00	9.00	20.67
-21.21/ -21.21/ .00	.00	10.00	21.44
-21.21/ -21.21/ .00	.00	11.00	24.17
-21.21/ -21.21/ .00	.00	12.00	28.26
-21.21/ -21.21/ .00	.00	13.00	33.19
-21.21/ -21.21/ .00	.00	14.00	38.57
-21.21/ -21.21/ .00	.00	15.05	44.16
-21.21/ -21.21/ .00	.00	16.00	49.78
-21.21/ -21.21/ .00	23.45	8.00	11.47
-21.21/ -21.21/ .00	23.45	9.00	8.97
-21.21/ -21.21/ .00	23.45	10.00	10.40
-21.21/ -21.21/ .00	23.45	11.00	14.62
-21.21/ -21.21/ .00	23.45	12.00	19.88
-21.21/ -21.21/ .00	23.45	13.00	25.46
-21.21/ -21.21/ .00	23.45	14.00	31.08
-21.21/ -21.21/ .00	23.45	15.00	36.58
-21.21/ -21.21/ .00	23.45	16.00	41.83

2.1 ผลจากโปรแกรมหารูปทรงของผิวสะท้อนแสง
เมื่อใช้รัศมีของช่องรับแสง 1.75 เมตร

```
RESULTS!
  HHB =   .00 -30.00    .00   DECS =  -23.45  TIMS =   8.00  ENERGY =    410.43
  HHB =   .00 -30.00    .00   DECS =     .00  TIMS =   8.00  ENERGY =    454.20
  HHB =   .00 -30.00    .00   DECS =   23.45  TIMS =   8.00  ENERGY =    476.75
  HHB =   .00 -30.00    .00   DECS =  -23.45  TIMS =   9.00  ENERGY =    439.35
  HHB =   .00 -30.00    .00   DECS =     .00  TIMS =   9.00  ENERGY =    454.20
  HHB =   .00 -30.00    .00   DECS =   23.45  TIMS =   9.00  ENERGY =    476.75
  HHB =   .00 -30.00    .00   DECS =  -23.45  TIMS =  10.00  ENERGY =    452.48
  HHB =   .00 -30.00    .00   DECS =     .00  TIMS =  10.00  ENERGY =    454.20
  HHB =   .00 -30.00    .00   DECS =   23.45  TIMS =  10.00  ENERGY =    476.75
  HHB =   .00 -30.00    .00   DECS =  -23.45  TIMS =  11.00  ENERGY =    455.17
  HHB =   .00 -30.00    .00   DECS =     .00  TIMS =  11.00  ENERGY =    454.20
  HHB =   .00 -30.00    .00   DECS =   23.45  TIMS =  11.00  ENERGY =    476.75
  HHB =   .00 -30.00    .00   DECS =  -23.45  TIMS =  12.00  ENERGY =    388.63
  HHB =   .00 -30.00    .00   DECS =     .00  TIMS =  12.00  ENERGY =    454.20
  HHB =   .00 -30.00    .00   DECS =   23.45  TIMS =  12.00  ENERGY =    476.75
  HHB =   .00 -30.00    .00   DECS =  -23.45  TIMS =  13.00  ENERGY =    455.17
  HHB =   .00 -30.00    .00   DECS =     .00  TIMS =  13.00  ENERGY =    454.20
  HHB =   .00 -30.00    .00   DECS =   23.45  TIMS =  13.00  ENERGY =    476.75
  HHB =   .00 -30.00    .00   DECS =  -23.45  TIMS =  14.00  ENERGY =    452.61
  HHB =   .00 -30.00    .00   DECS =     .00  TIMS =  14.00  ENERGY =    454.20
  HHB =   .00 -30.00    .00   DECS =   23.45  TIMS =  14.00  ENERGY =    476.75
  HHB =   .00 -30.00    .00   DECS =  -23.45  TIMS =  15.00  ENERGY =    439.36
  HHB =   .00 -30.00    .00   DECS =     .00  TIMS =  15.00  ENERGY =    454.20
  HHB =   .00 -30.00    .00   DECS =   23.45  TIMS =  15.00  ENERGY =    476.75
  HHB =   .00 -30.00    .00   DECS =  -23.45  TIMS =  16.00  ENERGY =    410.43
  HHB =   .00 -30.00    .00   DECS =     .00  TIMS =  16.00  ENERGY =    454.20
  HHB =   .00 -30.00    .00   DECS =   23.45  TIMS =  16.00  ENERGY =    476.75

  HELIOSTAT BASE LOCATION AT      =    .00,-30.00,    .00

        DESIGN DEC. FOR SETTING FACETS =   23.45

        DESIGN TIME FOR SETTING FACETS =     8.00

        NET ENERGY INTO RECEIVER =     476.75

RESULTS!
  HHB = 21.21 -21.21    .00   DECS =  -23.45  TIMS =   8.00  ENERGY =    389.66
  HHB = 21.21 -21.21    .00   DECS =     .00  TIMS =   8.00  ENERGY =    616.90
  HHB = 21.21 -21.21    .00   DECS =   23.45  TIMS =   8.00  ENERGY =    616.92
  HHB = 21.21 -21.21    .00   DECS =  -23.45  TIMS =   9.00  ENERGY =    469.16
  HHB = 21.21 -21.21    .00   DECS =     .00  TIMS =   9.00  ENERGY =    616.90
  HHB = 21.21 -21.21    .00   DECS =   23.45  TIMS =   9.00  ENERGY =    616.92
  HHB = 21.21 -21.21    .00   DECS =  -23.45  TIMS =  10.00  ENERGY =    527.49
  HHB = 21.21 -21.21    .00   DECS =     .00  TIMS =  10.00  ENERGY =    616.90
  HHB = 21.21 -21.21    .00   DECS =   23.45  TIMS =  10.00  ENERGY =    616.92
  HHB = 21.21 -21.21    .00   DECS =  -23.45  TIMS =  11.00  ENERGY =    587.46
  HHB = 21.21 -21.21    .00   DECS =     .00  TIMS =  11.00  ENERGY =    615.90
  HHB = 21.21 -21.21    .00   DECS =   23.45  TIMS =  11.00  ENERGY =    616.92
  HHB = 21.21 -21.21    .00   DECS =  -23.45  TIMS =  12.00  ENERGY =    606.80
  HHB = 21.21 -21.21    .00   DECS =     .00  TIMS =  12.00  ENERGY =    615.90
  HHB = 21.21 -21.21    .00   DECS =   23.45  TIMS =  12.00  ENERGY =    616.92
  HHB = 21.21 -21.21    .00   DECS =  -23.45  TIMS =  13.00  ENERGY =    613.54
  HHB = 21.21 -21.21    .00   DECS =     .00  TIMS =  13.00  ENERGY =    616.90
  HHB = 21.21 -21.21    .00   DECS =   23.45  TIMS =  13.00  ENERGY =    616.92
  HHB = 21.21 -21.21    .00   DECS =  -23.45  TIMS =  14.00  ENERGY =    617.66
  HHB = 21.21 -21.21    .00   DECS =     .00  TIMS =  14.00  ENERGY =    616.90
  HHB = 21.21 -21.21    .00   DECS =   23.45  TIMS =  14.00  ENERGY =    616.92
  HHB = 21.21 -21.21    .00   DECS =  -23.45  TIMS =  15.00  ENERGY =    615.65
  HHB = 21.21 -21.21    .00   DECS =     .00  TIMS =  15.00  ENERGY =    616.90
  HHB = 21.21 -21.21    .00   DECS =   23.45  TIMS =  15.00  ENERGY =    616.92
  HHB = 21.21 -21.21    .00   DECS =  -23.45  TIMS =  16.00  ENERGY =    609.33
  HHB = 21.21 -21.21    .00   DECS =     .00  TIMS =  16.00  ENERGY =    615.90
  HHB = 21.21 -21.21    .00   DECS =   23.45  TIMS =  16.00  ENERGY =    616.92

  HELIOSTAT BASE LOCATION AT      =   21.21,-21.21,    .00

        DESIGN DEC. FOR SETTING FACETS =  -23.45

        DESIGN TIME FOR SETTING FACETS =    14.00

        NET ENERGY INTO RECEIVER =     617.56
```

P.RESULTS1

HHB =	30.00	.00	.00	DECS =	-23.45	TIMS =	8.00	ENERGY =	371.76
HHB =	30.00	.00	.00	DECS =	.00	TIMS =	8.00	ENERGY =	527.71
HHB =	30.00	.00	.00	DECS =	23.45	TIMS =	8.00	ENERGY =	529.43
HHB =	30.00	.00	.00	DECS =	-23.45	TIMS =	9.00	ENERGY =	447.13
HHB =	30.00	.00	.00	DECS =	.00	TIMS =	9.00	ENERGY =	527.71
HHB =	30.00	.00	.00	DECS =	23.45	TIMS =	9.00	ENERGY =	529.43
HHB =	30.00	.00	.00	DECS =	-23.45	TIMS =	10.00	ENERGY =	511.55
HHB =	30.00	.00	.00	DECS =	.00	TIMS =	10.00	ENERGY =	527.71
HHB =	30.00	.00	.00	DECS =	23.45	TIMS =	10.00	ENERGY =	529.43
HHB =	30.00	.00	.00	DECS =	-23.45	TIMS =	11.00	ENERGY =	529.16
HHB =	30.00	.00	.00	DECS =	.00	TIMS =	11.00	ENERGY =	527.71
HHB =	30.00	.00	.00	DECS =	23.45	TIMS =	11.00	ENERGY =	529.43
HHB =	30.00	.00	.00	DECS =	-23.45	TIMS =	12.00	ENERGY =	532.57
HHB =	30.00	.00	.00	DECS =	.00	TIMS =	12.00	ENERGY =	527.71
HHB =	30.00	.00	.00	DECS =	23.45	TIMS =	12.00	ENERGY =	529.43
HHB =	30.00	.00	.00	DECS =	-23.45	TIMS =	13.00	ENERGY =	536.48
HHB =	30.00	.00	.00	DECS =	.00	TIMS =	13.00	ENERGY =	527.71
HHB =	30.00	.00	.00	DECS =	23.45	TIMS =	13.00	ENERGY =	529.43
HHB =	30.00	.00	.00	DECS =	-23.45	TIMS =	14.00	ENERGY =	535.13
HHB =	30.00	.00	.00	DECS =	.00	TIMS =	14.00	ENERGY =	527.71
HHB =	30.00	.00	.00	DECS =	23.45	TIMS =	14.00	ENERGY =	529.43
HHB =	30.00	.00	.00	DECS =	-23.45	TIMS =	15.00	ENERGY =	535.07
HHB =	30.00	.00	.00	DECS =	.00	TIMS =	15.00	ENERGY =	527.71
HHB =	30.00	.00	.00	DECS =	23.45	TIMS =	15.00	ENERGY =	529.43
HHB =	30.00	.00	.00	DECS =	-23.45	TIMS =	16.00	ENERGY =	533.92
HHB =	30.00	.00	.00	DECS =	.00	TIMS =	16.00	ENERGY =	527.71
HHB =	30.00	.00	.00	DECS =	23.45	TIMS =	16.00	ENERGY =	529.43

HELIOSTAT BASE LOCATION AT = 30.00, .00, .00

DESIGN DEC. FOR SETTING FACETS = -23.45

DESIGN TIME FOR SETTING FACETS = 13.00

NET ENERGY INTO RECEIVER = 536.48

P.RESULTS1

HHB =	21.21	21.21	.00	DECS =	-23.45	TIMS =	8.00	ENERGY =	647.10
HHB =	21.21	21.21	.00	DECS =	.00	TIMS =	8.00	ENERGY =	661.69
HHB =	21.21	21.21	.00	DECS =	23.45	TIMS =	8.00	ENERGY =	661.75
HHB =	21.21	21.21	.00	DECS =	-23.45	TIMS =	9.00	ENERGY =	665.34
HHB =	21.21	21.21	.00	DECS =	.00	TIMS =	9.00	ENERGY =	661.69
HHB =	21.21	21.21	.00	DECS =	23.45	TIMS =	9.00	ENERGY =	661.75
HHB =	21.21	21.21	.00	DECS =	-23.45	TIMS =	10.00	ENERGY =	664.59
HHB =	21.21	21.21	.00	DECS =	.00	TIMS =	10.00	ENERGY =	661.69
HHB =	21.21	21.21	.00	DECS =	23.45	TIMS =	10.00	ENERGY =	661.76
HHB =	21.21	21.21	.00	DECS =	-23.45	TIMS =	11.00	ENERGY =	664.57
HHB =	21.21	21.21	.00	DECS =	.00	TIMS =	11.00	ENERGY =	661.69
HHB =	21.21	21.21	.00	DECS =	23.45	TIMS =	11.00	ENERGY =	661.76
HHB =	21.21	21.21	.00	DECS =	-23.45	TIMS =	12.00	ENERGY =	662.90
HHB =	21.21	21.21	.00	DECS =	.00	TIMS =	12.00	ENERGY =	661.69
HHB =	21.21	21.21	.00	DECS =	23.45	TIMS =	12.00	ENERGY =	661.76
HHB =	21.21	21.21	.00	DECS =	-23.45	TIMS =	13.00	ENERGY =	662.99
HHB =	21.21	21.21	.00	DECS =	.00	TIMS =	13.00	ENERGY =	661.69
HHB =	21.21	21.21	.00	DECS =	23.45	TIMS =	13.00	ENERGY =	661.75
HHB =	21.21	21.21	.00	DECS =	-23.45	TIMS =	14.00	ENERGY =	662.85
HHB =	21.21	21.21	.00	DECS =	.00	TIMS =	14.00	ENERGY =	661.69
HHB =	21.21	21.21	.00	DECS =	23.45	TIMS =	14.00	ENERGY =	661.76
HHB =	21.21	21.21	.00	DECS =	-23.45	TIMS =	15.00	ENERGY =	664.32
HHB =	21.21	21.21	.00	DECS =	.00	TIMS =	15.00	ENERGY =	661.69
HHB =	21.21	21.21	.00	DECS =	23.45	TIMS =	15.00	ENERGY =	661.76
HHB =	21.21	21.21	.00	DECS =	-23.45	TIMS =	16.00	ENERGY =	664.31
HHB =	21.21	21.21	.00	DECS =	.00	TIMS =	16.00	ENERGY =	661.69
HHB =	21.21	21.21	.00	DECS =	23.45	TIMS =	16.00	ENERGY =	661.76

HELIOSTAT BASE LOCATION AT = 21.21, 21.21, .00

DESIGN DEC. FOR SETTING FACETS = -23.45

DESIGN TIME FOR SETTING FACETS = 9.00

NET ENERGY INTO RECEIVER = 665.34

```
P. RESULTS1
     HHB =    .00   30.00    .00   DECS =  -23.45  TIMS =   8.00  ENERGY =   614.22
     HHB =    .00   30.00    .00   DECS =     .00  TIMS =   8.00  ENERGY =   614.25
     HHB =    .00   30.00    .00   DECS =   23.45  TIMS =   8.00  ENERGY =   612.82
     HHB =    .00   30.00    .00   DECS =  -23.45  TIMS =   9.00  ENERGY =   614.23
     HHB =    .00   30.00    .00   DECS =     .00  TIMS =   9.00  ENERGY =   614.25
     HHB =    .00   30.00    .00   DECS =   23.45  TIMS =   9.00  ENERGY =   612.82
     HHB =    .00   30.00    .00   DECS =  -23.45  TIMS =  10.00  ENERGY =   614.23
     HHB =    .00   30.00    .00   DECS =     .00  TIMS =  10.00  ENERGY =   614.25
     HHB =    .00   30.00    .00   DECS =   23.45  TIMS =  10.00  ENERGY =   612.82
     HHB =    .00   30.00    .00   DECS =  -23.45  TIMS =  11.00  ENERGY =   614.24
     HHB =    .00   30.00    .00   DECS =     .00  TIMS =  11.00  ENERGY =   614.25
     HHB =    .00   30.00    .00   DECS =   23.45  TIMS =  11.00  ENERGY =   612.82
     HHB =    .00   30.00    .00   DECS =  -23.45  TIMS =  12.00  ENERGY =   614.24
     HHB =    .00   30.00    .00   DECS =     .00  TIMS =  12.00  ENERGY =   614.25
     HHB =    .00   30.00    .00   DECS =   23.45  TIMS =  12.00  ENERGY =   612.82
     HHB =    .00   30.00    .00   DECS =  -23.45  TIMS =  13.00  ENERGY =   614.24
     HHB =    .00   30.00    .00   DECS =     .00  TIMS =  13.00  ENERGY =   614.25
     HHB =    .00   30.00    .00   DECS =   23.45  TIMS =  13.00  ENERGY =   612.82
     HHB =    .00   30.00    .00   DECS =  -23.45  TIMS =  14.00  ENERGY =   614.23
     HHB =    .00   30.00    .00   DECS =     .00  TIMS =  14.00  ENERGY =   614.25
     HHB =    .00   30.00    .00   DECS =   23.45  TIMS =  14.00  ENERGY =   612.82
     HHB =    .00   30.00    .00   DECS =  -23.45  TIMS =  15.00  ENERGY =   614.23
     HHB =    .00   30.00    .00   DECS =     .00  TIMS =  15.00  ENERGY =   614.25
     HHB =    .00   30.00    .00   DECS =   23.45  TIMS =  15.00  ENERGY =   612.82
     HHB =    .00   30.00    .00   DECS =  -23.45  TIMS =  16.00  ENERGY =   614.21
     HHB =    .00   30.00    .00   DECS =     .00  TIMS =  16.00  ENERGY =   614.25
     HHB =    .00   30.00    .00   DECS =   23.45  TIMS =  16.00  ENERGY =   612.82

     HELIOSTAT BASE LOCATION AT      =     .00,  30.00,    .00

          DESIGN DEC. FOR SETTING FACETS =       .00

          DESIGN TIME FOR SETTING FACETS =      8.00

          NET ENERGY INTO RECEIVER =     614.25

P RESULTS1
     HHB =-21.21   21.21    .00   DECS =  -23.45  TIMS =   8.00  ENERGY =   679.25
     HHB =-21.21   21.21    .00   DECS =     .00  TIMS =   8.00  ENERGY =   678.24
     HHB =-21.21   21.21    .00   DECS =   23.45  TIMS =   8.00  ENERGY =   676.47
     HHB =-21.21   21.21    .00   DECS =  -23.45  TIMS =   9.00  ENERGY =   679.27
     HHB =-21.21   21.21    .00   DECS =     .00  TIMS =   9.00  ENERGY =   678.24
     HHB =-21.21   21.21    .00   DECS =   23.45  TIMS =   9.00  ENERGY =   676.47
     HHB =-21.21   21.21    .00   DECS =  -23.45  TIMS =  10.00  ENERGY =   677.83
     HHB =-21.21   21.21    .00   DECS =     .00  TIMS =  10.00  ENERGY =   678.24
     HHB =-21.21   21.21    .00   DECS =   23.45  TIMS =  10.00  ENERGY =   676.47
     HHB =-21.21   21.21    .00   DECS =  -23.45  TIMS =  11.00  ENERGY =   677.94
     HHB =-21.21   21.21    .00   DECS =     .00  TIMS =  11.00  ENERGY =   678.24
     HHB =-21.21   21.21    .00   DECS =   23.45  TIMS =  11.00  ENERGY =   676.47
     HHB =-21.21   21.21    .00   DECS =  -23.45  TIMS =  12.00  ENERGY =   677.54
     HHB =-21.21   21.21    .00   DECS =     .00  TIMS =  12.00  ENERGY =   678.24
     HHB =-21.21   21.21    .00   DECS =   23.45  TIMS =  12.00  ENERGY =   676.47
     HHB =-21.21   21.21    .00   DECS =  -23.45  TIMS =  13.00  ENERGY =   678.91
     HHB =-21.21   21.21    .00   DECS =     .00  TIMS =  13.00  ENERGY =   678.24
     HHB =-21.21   21.21    .00   DECS =   23.45  TIMS =  13.00  ENERGY =   676.47
     HHB =-21.21   21.21    .00   DECS =  -23.45  TIMS =  14.00  ENERGY =   678.16
     HHB =-21.21   21.21    .00   DECS =     .00  TIMS =  14.00  ENERGY =   678.24
     HHB =-21.21   21.21    .00   DECS =   23.45  TIMS =  14.00  ENERGY =   676.47
     HHB =-21.21   21.21    .00   DECS =  -23.45  TIMS =  15.00  ENERGY =   677.34
     HHB =-21.21   21.21    .00   DECS =     .00  TIMS =  15.00  ENERGY =   678.24
     HHB =-21.21   21.21    .00   DECS =   23.45  TIMS =  15.00  ENERGY =   676.47
     HHB =-21.21   21.21    .00   DECS =  -23.45  TIMS =  16.00  ENERGY =   658.03
     HHB =-21.21   21.21    .00   DECS =     .00  TIMS =  16.00  ENERGY =   678.24
     HHB =-21.21   21.21    .00   DECS =   23.45  TIMS =  16.00  ENERGY =   676.47

     HELIOSTAT BASE LOCATION AT      =  -21.21,  21.21,    .00

          DESIGN DEC. FOR SETTING FACETS =  -23.45

          DESIGN TIME FOR SETTING FACETS =      9.00

          NET ENERGY INTO RECEIVER =     679.27
```

```
P RESULTS1
    HHB =-30.00      .00      .00     DECS =  -23.45   TIMS =    8.00   ENERGY =      533.72
    HHB =-30.00      .00      .00     DECS =     .00   TIMS =    8.00   ENERGY =      527.06
    HHB =-30.00      .00      .00     DECS =   23.45   TIMS =    8.00   ENERGY =      528.64
    HHB =-30.00      .00      .00     DECS =  -23.45   TIMS =    9.00   ENERGY =      535.07
    HHB =-30.00      .00      .00     DECS =     .00   TIMS =    9.00   ENERGY =      527.06
    HHB =-30.00      .00      .00     DECS =   23.45   TIMS =    9.00   ENERGY =      528.64
    HHB =-30.00      .00      .00     DECS =  -23.45   TIMS =   10.00   ENERGY =      535.13
    HHB =-30.00      .00      .00     DECS =     .00   TIMS =   10.00   ENERGY =      527.06
    HHB =-30.00      .00      .00     DECS =   23.45   TIMS =   10.00   ENERGY =      528.64
    HHB =-30.00      .00      .00     DECS =  -23.45   TIMS =   11.00   ENERGY =      536.65
    HHB =-30.00      .00      .00     DECS =     .00   TIMS =   11.00   ENERGY =      527.06
    HHB =-30.00      .00      .00     DECS =   23.45   TIMS =   11.00   ENERGY =      528.64
    HHB =-30.00      .00      .00     DECS =  -23.45   TIMS =   12.00   ENERGY =      532.59
    HHB =-30.00      .00      .00     DECS =     .00   TIMS =   12.00   ENERGY =      527.06
    HHB =-30.00      .00      .00     DECS =   23.45   TIMS =   12.00   ENERGY =      528.64
    HHB =-30.00      .00      .00     DECS =  -23.45   TIMS =   13.00   ENERGY =      528.16
    HHB =-30.00      .00      .00     DECS =     .00   TIMS =   13.00   ENERGY =      527.06
    HHB =-30.00      .00      .00     DECS =   23.45   TIMS =   13.00   ENERGY =      528.64
    HHB =-30.00      .00      .00     DECS =  -23.45   TIMS =   14.00   ENERGY =      511.55
    HHB =-30.00      .00      .00     DECS =     .00   TIMS =   14.00   ENERGY =      527.06
    HHB =-30.00      .00      .00     DECS =   23.45   TIMS =   14.00   ENERGY =      528.64
    HHB =-30.00      .00      .00     DECS =  -23.45   TIMS =   15.00   ENERGY =      447.12
    HHB =-30.00      .00      .00     DECS =     .00   TIMS =   15.00   ENERGY =      527.06
    HHB =-30.00      .00      .00     DECS =   23.45   TIMS =   15.00   ENERGY =      528.64
    HHB =-30.00      .00      .00     DECS =  -23.45   TIMS =   16.00   ENERGY =      371.61
    HHB =-30.00      .00      .00     DECS =     .00   TIMS =   16.00   ENERGY =      527.06
    HHB =-30.00      .00      .00     DECS =   23.45   TIMS =   16.00   ENERGY =      528.64

    HELIOSTAT BASE LOCATION AT        =  -30.00,    .00,    .00

         DESIGN DEC. FOR SETTING FACETS =  -23.45

         DESIGN TIME FOR SETTING FACETS =    11.00

         NET ENERGY INTO RECEIVER =    536.65
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P RESULTS1
    HHB =-21.21  -21.21      .00     DECS =  -23.45   TIMS =    8.00   ENERGY =      609.33
    HHB =-21.21  -21.21      .00     DECS =     .00   TIMS =    8.00   ENERGY =      614.40
    HHB =-21.21  -21.21      .00     DECS =   23.45   TIMS =    8.00   ENERGY =      616.53
    HHB =-21.21  -21.21      .00     DECS =  -23.45   TIMS =    9.00   ENERGY =      615.65
    HHB =-21.21  -21.21      .00     DECS =     .00   TIMS =    9.00   ENERGY =      614.40
    HHB =-21.21  -21.21      .00     DECS =   23.45   TIMS =    9.00   ENERGY =      616.53
    HHB =-21.21  -21.21      .00     DECS =  -23.45   TIMS =   10.00   ENERGY =      617.66
    HHB =-21.21  -21.21      .00     DECS =     .00   TIMS =   10.00   ENERGY =      614.40
    HHB =-21.21  -21.21      .00     DECS =   23.45   TIMS =   10.00   ENERGY =      616.53
    HHB =-21.21  -21.21      .00     DECS =  -23.45   TIMS =   11.00   ENERGY =      613.68
    HHB =-21.21  -21.21      .00     DECS =     .00   TIMS =   11.00   ENERGY =      614.40
    HHB =-21.21  -21.21      .00     DECS =   23.45   TIMS =   11.00   ENERGY =      616.53
    HHB =-21.21  -21.21      .00     DECS =  -23.45   TIMS =   12.00   ENERGY =      605.91
    HHB =-21.21  -21.21      .00     DECS =     .00   TIMS =   12.00   ENERGY =      614.40
    HHB =-21.21  -21.21      .00     DECS =   23.45   TIMS =   12.00   ENERGY =      616.53
    HHB =-21.21  -21.21      .00     DECS =  -23.45   TIMS =   13.00   ENERGY =      589.34
    HHB =-21.21  -21.21      .00     DECS =     .00   TIMS =   13.00   ENERGY =      614.40
    HHB =-21.21  -21.21      .00     DECS =   23.45   TIMS =   13.00   ENERGY =      616.53
    HHB =-21.21  -21.21      .00     DECS =  -23.45   TIMS =   14.00   ENERGY =      526.27
    HHB =-21.21  -21.21      .00     DECS =     .00   TIMS =   14.00   ENERGY =      614.40
    HHB =-21.21  -21.21      .00     DECS =   23.45   TIMS =   14.00   ENERGY =      616.53
    HHB =-21.21  -21.21      .00     DECS =  -23.45   TIMS =   15.00   ENERGY =      469.30
    HHB =-21.21  -21.21      .00     DECS =     .00   TIMS =   15.00   ENERGY =      614.40
    HHB =-21.21  -21.21      .00     DECS =   23.45   TIMS =   15.00   ENERGY =      616.53
    HHB =-21.21  -21.21      .00     DECS =  -23.45   TIMS =   16.00   ENERGY =      309.49
    HHB =-21.21  -21.21      .00     DECS =     .00   TIMS =   16.00   ENERGY =      614.40
    HHB =-21.21  -21.21      .00     DECS =   23.45   TIMS =   16.00   ENERGY =      616.53

    HELIOSTAT BASE LOCATION AT        =  -21.21,-21.21,    .00

         DESIGN DEC. FOR SETTING FACETS =  -23.45

         DESIGN TIME FOR SETTING FACETS =    10.00

         NET ENERGY INTO RECEIVER =    517.56
```

2.2 ผลจากโปรแกรมหารูปทรงของผิวสะท้อนแสง
เมื่อใช้รัศมีของช่องรับแสง 1.50 เมตร

P.RESULTSI

HHB =	.00	-30.00	.00	DECS = -23.45	TIMS = 8.00	ENERGY =	374.21
HHB =	.00	-30.00	.00	DECS = .00	TIMS = 8.00	ENERGY =	428.32
HHB =	.00	-30.00	.00	DECS = 23.45	TIMS = 8.00	ENERGY =	462.29
HHB =	.00	-30.00	.00	DECS = -23.45	TIMS = 9.00	ENERGY =	412.34
HHB =	.00	-30.00	.00	DECS = .00	TIMS = 9.00	ENERGY =	428.32
HHB =	.00	-30.00	.00	DECS = 23.45	TIMS = 9.00	ENERGY =	462.29
HHB =	.00	-30.00	.00	DECS = -23.45	TIMS = 10.00	ENERGY =	432.83
HHB =	.00	-30.00	.00	DECS = .00	TIMS = 10.00	ENERGY =	428.32
HHB =	.00	-30.00	.00	DECS = 23.45	TIMS = 10.00	ENERGY =	462.29
HHB =	.00	-30.00	.00	DECS = -23.45	TIMS = 11.00	ENERGY =	432.44
HHB =	.00	-30.00	.00	DECS = .00	TIMS = 11.00	ENERGY =	428.32
HHB =	.00	-30.00	.00	DECS = 23.45	TIMS = 11.00	ENERGY =	462.29
HHB =	.00	-30.00	.00	DECS = -23.45	TIMS = 12.00	ENERGY =	343.59
HHB =	.00	-30.00	.00	DECS = .00	TIMS = 12.00	ENERGY =	428.32
HHB =	.00	-30.00	.00	DECS = 23.45	TIMS = 12.00	ENERGY =	462.29
HHB =	.00	-30.00	.00	DECS = -23.45	TIMS = 13.00	ENERGY =	431.81
HHB =	.00	-30.00	.00	DECS = .00	TIMS = 13.00	ENERGY =	428.32
HHB =	.00	-30.00	.00	DECS = 23.45	TIMS = 13.00	ENERGY =	462.29
HHB =	.00	-30.00	.00	DECS = -23.45	TIMS = 14.00	ENERGY =	432.83
HHB =	.00	-30.00	.00	DECS = .00	TIMS = 14.00	ENERGY =	428.32
HHB =	.00	-30.00	.00	DECS = 23.45	TIMS = 14.00	ENERGY =	462.29
HHB =	.00	-30.00	.00	DECS = -23.45	TIMS = 15.00	ENERGY =	412.34
HHB =	.00	-30.00	.00	DECS = .00	TIMS = 15.00	ENERGY =	428.32
HHB =	.00	-30.00	.00	DECS = 23.45	TIMS = 15.00	ENERGY =	462.29
HHB =	.00	-30.00	.00	DECS = -23.45	TIMS = 16.00	ENERGY =	374.21
HHB =	.00	-30.00	.00	DECS = .00	TIMS = 16.00	ENERGY =	428.32
HHB =	.00	-30.00	.00	DECS = 23.45	TIMS = 16.00	ENERGY =	462.29

HELIOSTAT BASE LOCATION AT = .00, -30.00, .00

DESIGN DEC. FOR SETTING FACETS = 23.45

DESIGN TIME FOR SETTING FACETS = 8.00

NET ENERGY INTO RECEIVER = 462.29

P.RESULTSI

HHB =	21.21	-21.21	.00	DECS = -23.45	TIMS = 8.00	ENERGY =	350.96
HHB =	21.21	-21.21	.00	DECS = .00	TIMS = 8.00	ENERGY =	604.10
HHB =	21.21	-21.21	.00	DECS = 23.45	TIMS = 8.00	ENERGY =	605.52
HHB =	21.21	-21.21	.00	DECS = -23.45	TIMS = 9.00	ENERGY =	414.43
HHB =	21.21	-21.21	.00	DECS = .00	TIMS = 9.00	ENERGY =	604.10
HHB =	21.21	-21.21	.00	DECS = 23.45	TIMS = 9.00	ENERGY =	605.52
HHB =	21.21	-21.21	.00	DECS = -23.45	TIMS = 10.00	ENERGY =	491.93
HHB =	21.21	-21.21	.00	DECS = .00	TIMS = 10.00	ENERGY =	604.10
HHB =	21.21	-21.21	.00	DECS = 23.45	TIMS = 10.00	ENERGY =	605.52
HHB =	21.21	-21.21	.00	DECS = -23.45	TIMS = 11.00	ENERGY =	555.01
HHB =	21.21	-21.21	.00	DECS = .00	TIMS = 11.00	ENERGY =	604.10
HHB =	21.21	-21.21	.00	DECS = 23.45	TIMS = 11.00	ENERGY =	605.52
HHB =	21.21	-21.21	.00	DECS = -23.45	TIMS = 12.00	ENERGY =	586.03
HHB =	21.21	-21.21	.00	DECS = .00	TIMS = 12.00	ENERGY =	604.10
HHB =	21.21	-21.21	.00	DECS = 23.45	TIMS = 12.00	ENERGY =	605.52
HHB =	21.21	-21.21	.00	DECS = -23.45	TIMS = 13.00	ENERGY =	596.97
HHB =	21.21	-21.21	.00	DECS = .00	TIMS = 13.00	ENERGY =	604.10
HHB =	21.21	-21.21	.00	DECS = 23.45	TIMS = 13.00	ENERGY =	605.52
HHB =	21.21	-21.21	.00	DECS = -23.45	TIMS = 14.00	ENERGY =	600.71
HHB =	21.21	-21.21	.00	DECS = .00	TIMS = 14.00	ENERGY =	604.10
HHB =	21.21	-21.21	.00	DECS = 23.45	TIMS = 14.00	ENERGY =	605.52
HHB =	21.21	-21.21	.00	DECS = -23.45	TIMS = 15.00	ENERGY =	598.83
HHB =	21.21	-21.21	.00	DECS = .00	TIMS = 15.00	ENERGY =	604.10
HHB =	21.21	-21.21	.00	DECS = 23.45	TIMS = 15.00	ENERGY =	605.52
HHB =	21.21	-21.21	.00	DECS = -23.45	TIMS = 16.00	ENERGY =	590.18
HHB =	21.21	-21.21	.00	DECS = .00	TIMS = 16.00	ENERGY =	604.10
HHB =	21.21	-21.21	.00	DECS = 23.45	TIMS = 16.00	ENERGY =	605.52

HELIOSTAT BASE LOCATION AT = 21.21, -21.21, .00

DESIGN DEC. FOR SETTING FACETS = 23.45

DESIGN TIME FOR SETTING FACETS = 8.00

NET ENERGY INTO RECEIVER = 605.52

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P.RESULTS1
 HHB = 30.00    .00    .00   DECS =  -23.45   TIMS =   8.00   ENERGY =   333.69
 HHB = 30.00    .00    .00   DECS =     .00   TIMS =   8.00   ENERGY =   516.08
 HHB = 30.00    .00    .00   DECS =   23.45   TIMS =   8.00   ENERGY =   517.44
 HHB = 30.00    .00    .00   DECS =  -23.45   TIMS =   9.00   ENERGY =   407.78
 HHB = 30.00    .00    .00   DECS =     .00   TIMS =   9.00   ENERGY =   516.08
 HHB = 30.00    .00    .00   DECS =   23.45   TIMS =   9.00   ENERGY =   517.44
 HHB = 30.00    .00    .00   DECS =  -23.45   TIMS =  10.00   ENERGY =   486.48
 HHB = 30.00    .00    .00   DECS =     .00   TIMS =  10.00   ENERGY =   516.08
 HHB = 30.00    .00    .00   DECS =   23.45   TIMS =  10.00   ENERGY =   517.44
 HHB = 30.00    .00    .00   DECS =  -23.45   TIMS =  11.00   ENERGY =   513.31
 HHB = 30.00    .00    .00   DECS =     .00   TIMS =  11.00   ENERGY =   516.08
 HHB = 30.00    .00    .00   DECS =   23.45   TIMS =  11.00   ENERGY =   517.44
 HHB = 30.00    .00    .00   DECS =  -23.45   TIMS =  12.00   ENERGY =   522.65
 HHB = 30.00    .00    .00   DECS =     .00   TIMS =  12.00   ENERGY =   516.08
 HHB = 30.00    .00    .00   DECS =   23.45   TIMS =  12.00   ENERGY =   517.44
 HHB = 30.00    .00    .00   DECS =  -23.45   TIMS =  13.00   ENERGY =   527.95
 HHB = 30.00    .00    .00   DECS =     .00   TIMS =  13.00   ENERGY =   516.08
 HHB = 30.00    .00    .00   DECS =   23.45   TIMS =  13.00   ENERGY =   517.44
 HHB = 30.00    .00    .00   DECS =  -23.45   TIMS =  14.00   ENERGY =   526.26
 HHB = 30.00    .00    .00   DECS =     .00   TIMS =  14.00   ENERGY =   516.08
 HHB = 30.00    .00    .00   DECS =   23.45   TIMS =  14.00   ENERGY =   517.44
 HHB = 30.00    .00    .00   DECS =  -23.45   TIMS =  15.00   ENERGY =   526.52
 HHB = 30.00    .00    .00   DECS =     .00   TIMS =  15.00   ENERGY =   516.08
 HHB = 30.00    .00    .00   DECS =   23.45   TIMS =  15.00   ENERGY =   517.44
 HHB = 30.00    .00    .00   DECS =  -23.45   TIMS =  16.00   ENERGY =   523.00
 HHB = 30.00    .00    .00   DECS =     .00   TIMS =  16.00   ENERGY =   516.08
 HHB = 30.00    .00    .00   DECS =   23.45   TIMS =  16.00   ENERGY =   517.44

 HELIOSTAT BASE LOCATION AT   =   30.00,   .00,   .00

     DESIGN DEC. FOR SETTING FACETS =  -23.45

     DESIGN TIME FOR SETTING FACETS =   13.00

     NET ENERGY INTO RECEIVER =   527.95

P.RESULTS1
 HHB = 21.21  21.21    .00   DECS =  -23.45   TIMS =   8.00   ENERGY =   612.67
 HHB = 21.21  21.21    .00   DECS =     .00   TIMS =   8.00   ENERGY =   658.24
 HHB = 21.21  21.21    .00   DECS =   23.45   TIMS =   8.00   ENERGY =   657.71
 HHB = 21.21  21.21    .00   DECS =  -23.45   TIMS =   9.00   ENERGY =   660.83
 HHB = 21.21  21.21    .00   DECS =     .00   TIMS =   9.00   ENERGY =   658.24
 HHB = 21.21  21.21    .00   DECS =   23.45   TIMS =   9.00   ENERGY =   657.71
 HHB = 21.21  21.21    .00   DECS =  -23.45   TIMS =  10.00   ENERGY =   664.03
 HHB = 21.21  21.21    .00   DECS =     .00   TIMS =  10.00   ENERGY =   658.24
 HHB = 21.21  21.21    .00   DECS =   23.45   TIMS =  10.00   ENERGY =   657.71
 HHB = 21.21  21.21    .00   DECS =  -23.45   TIMS =  11.00   ENERGY =   663.56
 HHB = 21.21  21.21    .00   DECS =     .00   TIMS =  11.00   ENERGY =   658.24
 HHB = 21.21  21.21    .00   DECS =   23.45   TIMS =  11.00   ENERGY =   657.71
 HHB = 21.21  21.21    .00   DECS =  -23.45   TIMS =  12.00   ENERGY =   661.11
 HHB = 21.21  21.21    .00   DECS =     .00   TIMS =  12.00   ENERGY =   658.24
 HHB = 21.21  21.21    .00   DECS =   23.45   TIMS =  12.00   ENERGY =   657.71
 HHB = 21.21  21.21    .00   DECS =  -23.45   TIMS =  13.00   ENERGY =   660.67
 HHB = 21.21  21.21    .00   DECS =     .00   TIMS =  13.00   ENERGY =   658.24
 HHB = 21.21  21.21    .00   DECS =   23.45   TIMS =  13.00   ENERGY =   657.71
 HHB = 21.21  21.21    .00   DECS =  -23.45   TIMS =  14.00   ENERGY =   660.55
 HHB = 21.21  21.21    .00   DECS =     .00   TIMS =  14.00   ENERGY =   658.24
 HHB = 21.21  21.21    .00   DECS =   23.45   TIMS =  14.00   ENERGY =   657.71
 HHB = 21.21  21.21    .00   DECS =  -23.45   TIMS =  15.00   ENERGY =   661.82
 HHB = 21.21  21.21    .00   DECS =     .00   TIMS =  15.00   ENERGY =   658.24
 HHB = 21.21  21.21    .00   DECS =   23.45   TIMS =  15.00   ENERGY =   657.71
 HHB = 21.21  21.21    .00   DECS =  -23.45   TIMS =  16.00   ENERGY =   661.81
 HHB = 21.21  21.21    .00   DECS =     .00   TIMS =  16.00   ENERGY =   658.24
 HHB = 21.21  21.21    .00   DECS =   23.45   TIMS =  16.00   ENERGY =   657.71

 HELIOSTAT BASE LOCATION AT   =   21.21,  21.21,   .00

     DESIGN DEC. FOR SETTING FACETS =  -23.45

     DESIGN TIME FOR SETTING FACETS =   10.00

     NET ENERGY INTO RECEIVER =   664.03
```

```
P.RESULTS1
    HHB =   .00  30.00    .00   DECS =  -23.45  TIMS =   8.00  ENERGY =   613.39
    HHB =   .00  30.00    .00   DECS =     .00  TIMS =   8.00  ENERGY =   613.60
    HHB =   .00  30.00    .00   DECS =   23.45  TIMS =   8.00  ENERGY =   607.76
    HHB =   .00  30.00    .00   DECS =  -23.45  TIMS =   9.00  ENERGY =   614.23
    HHB =   .00  30.00    .00   DECS =     .00  TIMS =   9.00  ENERGY =   613.60
    HHB =   .00  30.00    .00   DECS =   23.45  TIMS =   9.00  ENERGY =   607.76
    HHB =   .00  30.00    .00   DECS =  -23.45  TIMS =  10.00  ENERGY =   614.23
    HHB =   .00  30.00    .00   DECS =     .00  TIMS =  10.00  ENERGY =   613.60
    HHB =   .00  30.00    .00   DECS =   23.45  TIMS =  10.00  ENERGY =   607.76
    HHB =   .00  30.00    .00   DECS =  -23.45  TIMS =  11.00  ENERGY =   614.24
    HHB =   .00  30.00    .00   DECS =     .00  TIMS =  11.00  ENERGY =   613.60
    HHB =   .00  30.00    .00   DECS =   23.45  TIMS =  11.00  ENERGY =   607.76
    HHB =   .00  30.00    .00   DECS =  -23.45  TIMS =  12.00  ENERGY =   614.24
    HHB =   .00  30.00    .00   DECS =     .00  TIMS =  12.00  ENERGY =   613.60
    HHB =   .00  30.00    .00   DECS =   23.45  TIMS =  12.00  ENERGY =   607.76
    HHB =   .00  30.00    .00   DECS =  -23.45  TIMS =  13.00  ENERGY =   614.24
    HHB =   .00  30.00    .00   DECS =     .00  TIMS =  13.00  ENERGY =   613.60
    HHB =   .00  30.00    .00   DECS =   23.45  TIMS =  13.00  ENERGY =   607.76
    HHB =   .00  30.00    .00   DECS =  -23.45  TIMS =  14.00  ENERGY =   614.23
    HHB =   .00  30.00    .00   DECS =     .00  TIMS =  14.00  ENERGY =   613.60
    HHB =   .00  30.00    .00   DECS =   23.45  TIMS =  14.00  ENERGY =   607.76
    HHB =   .00  30.00    .00   DECS =  -23.45  TIMS =  15.00  ENERGY =   614.23
    HHB =   .00  30.00    .00   DECS =     .00  TIMS =  15.00  ENERGY =   613.60
    HHB =   .00  30.00    .00   DECS =   23.45  TIMS =  15.00  ENERGY =   607.76
    HHB =   .00  30.00    .00   DECS =  -23.45  TIMS =  16.00  ENERGY =   613.89
    HHB =   .00  30.00    .00   DECS =     .00  TIMS =  16.00  ENERGY =   613.60
    HHB =   .00  30.00    .00   DECS =   23.45  TIMS =  16.00  ENERGY =   607.76

    HELIOSTAT BASE LOCATION AT       =       .00,  30.00,     .00

          DESIGN DEC. FOR SETTING FACETS =  -23.45

          DESIGN TIME FOR SETTING FACETS =   12.00

          NET ENERGY INTO RECEIVER =     614.24

P.RESULTS1
    HHB =-21.21  21.21    .00   DECS =  -23.45  TIMS =   8.00  ENERGY =   675.99
    HHB =-21.21  21.21    .00   DECS =     .00  TIMS =   8.00  ENERGY =   673.75
    HHB =-21.21  21.21    .00   DECS =   23.45  TIMS =   8.00  ENERGY =   671.84
    HHB =-21.21  21.21    .00   DECS =  -23.45  TIMS =   9.00  ENERGY =   676.16
    HHB =-21.21  21.21    .00   DECS =     .00  TIMS =   9.00  ENERGY =   673.75
    HHB =-21.21  21.21    .00   DECS =   23.45  TIMS =   9.00  ENERGY =   671.84
    HHB =-21.21  21.21    .00   DECS =  -23.45  TIMS =  10.00  ENERGY =   674.99
    HHB =-21.21  21.21    .00   DECS =     .00  TIMS =  10.00  ENERGY =   673.75
    HHB =-21.21  21.21    .00   DECS =   23.45  TIMS =  10.00  ENERGY =   671.84
    HHB =-21.21  21.21    .00   DECS =  -23.45  TIMS =  11.00  ENERGY =   674.70
    HHB =-21.21  21.21    .00   DECS =     .00  TIMS =  11.00  ENERGY =   673.75
    HHB =-21.21  21.21    .00   DECS =   23.45  TIMS =  11.00  ENERGY =   671.84
    HHB =-21.21  21.21    .00   DECS =  -23.45  TIMS =  12.00  ENERGY =   674.66
    HHB =-21.21  21.21    .00   DECS =     .00  TIMS =  12.00  ENERGY =   673.75
    HHB =-21.21  21.21    .00   DECS =   23.45  TIMS =  12.00  ENERGY =   671.84
    HHB =-21.21  21.21    .00   DECS =  -23.45  TIMS =  13.00  ENERGY =   676.02
    HHB =-21.21  21.21    .00   DECS =     .00  TIMS =  13.00  ENERGY =   673.75
    HHB =-21.21  21.21    .00   DECS =   23.45  TIMS =  13.00  ENERGY =   671.84
    HHB =-21.21  21.21    .00   DECS =  -23.45  TIMS =  14.00  ENERGY =   675.40
    HHB =-21.21  21.21    .00   DECS =     .00  TIMS =  14.00  ENERGY =   673.75
    HHB =-21.21  21.21    .00   DECS =   23.45  TIMS =  14.00  ENERGY =   671.84
    HHB =-21.21  21.21    .00   DECS =  -23.45  TIMS =  15.00  ENERGY =   671.27
    HHB =-21.21  21.21    .00   DECS =     .00  TIMS =  15.00  ENERGY =   673.75
    HHB =-21.21  21.21    .00   DECS =   23.45  TIMS =  15.00  ENERGY =   671.84
    HHB =-21.21  21.21    .00   DECS =  -23.45  TIMS =  16.00  ENERGY =   621.55
    HHB =-21.21  21.21    .00   DECS =     .00  TIMS =  16.00  ENERGY =   673.75
    HHB =-21.21  21.21    .00   DECS =   23.45  TIMS =  16.00  ENERGY =   671.84

    HELIOSTAT BASE LOCATION AT       =  -21.21,  21.21,     .00

          DESIGN DEC. FOR SETTING FACETS =  -23.45

          DESIGN TIME FOR SETTING FACETS =    9.00

          NET ENERGY INTO RECEIVER =    676.16
```

```
P RESULTS1
  HHB =-30.00    .00    .00   DECS =  -23.45   TIMS =   8.00   ENERGY =   523.00
  HHB =-30.00    .00    .00   DECS =     .00   TIMS =   8.00   ENERGY =   515.46
  HHB =-30.00    .00    .00   DECS =   23.45   TIMS =   8.00   ENERGY =   516.36
  HHB =-30.00    .00    .00   DECS =  -23.45   TIMS =   9.00   ENERGY =   526.52
  HHB =-30.00    .00    .00   DECS =     .00   TIMS =   9.00   ENERGY =   515.46
  HHB =-30.00    .00    .00   DECS =   23.45   TIMS =   9.00   ENERGY =   516.36
  HHB =-30.00    .00    .00   DECS =  -23.45   TIMS =  10.00   ENERGY =   526.43
  HHB =-30.00    .00    .00   DECS =     .00   TIMS =  10.00   ENERGY =   515.46
  HHB =-30.00    .00    .00   DECS =   23.45   TIMS =  10.00   ENERGY =   516.36
  HHB =-30.00    .00    .00   DECS =  -23.45   TIMS =  11.00   ENERGY =   527.95
  HHB =-30.00    .00    .00   DECS =     .00   TIMS =  11.00   ENERGY =   515.46
  HHB =-30.00    .00    .00   DECS =   23.45   TIMS =  11.00   ENERGY =   516.36
  HHB =-30.00    .00    .00   DECS =  -23.45   TIMS =  12.00   ENERGY =   522.65
  HHB =-30.00    .00    .00   DECS =     .00   TIMS =  12.00   ENERGY =   515.46
  HHB =-30.00    .00    .00   DECS =   23.45   TIMS =  12.00   ENERGY =   516.36
  HHB =-30.00    .00    .00   DECS =  -23.45   TIMS =  13.00   ENERGY =   513.47
  HHB =-30.00    .00    .00   DECS =     .00   TIMS =  13.00   ENERGY =   515.46
  HHB =-30.00    .00    .00   DECS =   23.45   TIMS =  13.00   ENERGY =   516.36
  HHB =-30.00    .00    .00   DECS =  -23.45   TIMS =  14.00   ENERGY =   486.48
  HHB =-30.00    .00    .00   DECS =     .00   TIMS =  14.00   ENERGY =   515.46
  HHB =-30.00    .00    .00   DECS =   23.45   TIMS =  14.00   ENERGY =   516.36
  HHB =-30.00    .00    .00   DECS =  -23.45   TIMS =  15.00   ENERGY =   407.78
  HHB =-30.00    .00    .00   DECS =     .00   TIMS =  15.00   ENERGY =   515.46
  HHB =-30.00    .00    .00   DECS =   23.45   TIMS =  15.00   ENERGY =   516.36
  HHB =-30.00    .00    .00   DECS =  -23.45   TIMS =  16.00   ENERGY =   333.69
  HHB =-30.00    .00    .00   DECS =     .00   TIMS =  16.00   ENERGY =   515.46
  HHB =-30.00    .00    .00   DECS =   23.45   TIMS =  16.00   ENERGY =   516.36

  HELIOSTAT BASE LOCATION AT       =  -30.00,   .00,   .00

       DESIGN DEC. FOR SETTING FACETS =  -23.45

       DESIGN TIME FOR SETTING FACETS =  11.00

       NET ENERGY INTO RECEIVER =  527.95

P,RESULTS1
  HHB =-21.21  -21.21    .00   DECS =  -23.45   TIMS =   8.00   ENERGY =   590.36
  HHB =-21.21  -21.21    .00   DECS =     .00   TIMS =   8.00   ENERGY =   599.77
  HHB =-21.21  -21.21    .00   DECS =   23.45   TIMS =   8.00   ENERGY =   604.91
  HHB =-21.21  -21.21    .00   DECS =  -23.45   TIMS =   9.00   ENERGY =   598.83
  HHB =-21.21  -21.21    .00   DECS =     .00   TIMS =   9.00   ENERGY =   599.77
  HHB =-21.21  -21.21    .00   DECS =   23.45   TIMS =   9.00   ENERGY =   604.91
  HHB =-21.21  -21.21    .00   DECS =  -23.45   TIMS =  10.00   ENERGY =   600.71
  HHB =-21.21  -21.21    .00   DECS =     .00   TIMS =  10.00   ENERGY =   599.77
  HHB =-21.21  -21.21    .00   DECS =   23.45   TIMS =  10.00   ENERGY =   604.91
  HHB =-21.21  -21.21    .00   DECS =  -23.45   TIMS =  11.00   ENERGY =   596.97
  HHB =-21.21  -21.21    .00   DECS =     .00   TIMS =  11.00   ENERGY =   599.77
  HHB =-21.21  -21.21    .00   DECS =   23.45   TIMS =  11.00   ENERGY =   604.91
  HHB =-21.21  -21.21    .00   DECS =  -23.45   TIMS =  12.00   ENERGY =   586.03
  HHB =-21.21  -21.21    .00   DECS =     .00   TIMS =  12.00   ENERGY =   599.77
  HHB =-21.21  -21.21    .00   DECS =   23.45   TIMS =  12.00   ENERGY =   604.91
  HHB =-21.21  -21.21    .00   DECS =  -23.45   TIMS =  13.00   ENERGY =   555.12
  HHB =-21.21  -21.21    .00   DECS =     .00   TIMS =  13.00   ENERGY =   599.77
  HHB =-21.21  -21.21    .00   DECS =   23.45   TIMS =  13.00   ENERGY =   604.91
  HHB =-21.21  -21.21    .00   DECS =  -23.45   TIMS =  14.00   ENERGY =   491.38
  HHB =-21.21  -21.21    .00   DECS =     .00   TIMS =  14.00   ENERGY =   599.77
  HHB =-21.21  -21.21    .00   DECS =   23.45   TIMS =  14.00   ENERGY =   604.91
  HHB =-21.21  -21.21    .00   DECS =  -23.45   TIMS =  15.00   ENERGY =   414.43
  HHB =-21.21  -21.21    .00   DECS =     .00   TIMS =  15.00   ENERGY =   599.77
  HHB =-21.21  -21.21    .00   DECS =   23.45   TIMS =  15.00   ENERGY =   604.91
  HHB =-21.21  -21.21    .00   DECS =  -23.45   TIMS =  16.00   ENERGY =   350.96
  HHB =-21.21  -21.21    .00   DECS =     .00   TIMS =  16.00   ENERGY =   599.77
  HHB =-21.21  -21.21    .00   DECS =   23.45   TIMS =  16.00   ENERGY =   604.91

  HELIOSTAT BASE LOCATION AT       =  -21.21,-21.21,   .00

       DESIGN DEC. FOR SETTING FACETS =   23.45

       DESIGN TIME FOR SETTING FACETS =   8.00

       NET ENERGY INTO RECEIVER =  604.91
```

3.1 ผลจากโปรแกรมหาปริมาณพลังงานและค่าการแจกแจง
ความเข้มของรังสี เมื่อใช้ข้อมูลชุดที่ 1 (NCUR = 1)

```
-ELT,IL P.DATAS2
ELT 8R1 5740IC 03/07/84 19:50:46 (->U)
     1.          00      13.74 0.3 3.29 1.75 0.9 3 16 1 1 10 3/
     2.          00      0.0 0.0 32.0 0.0 0.173648 -0.9848/
     3.          00      8.0 18.0 1.0 1.5 1.5 10/
     4.          00      0.0 -30.0 0.0 21.21 -21.21 0.0 30.0 0.0 0.0 21.21 21.21 0.0 0.0 30.0 0.0 -21.21
     5.          00       21.21 0.0 -30.0 0.0 0.0 -21.21 -21.21 0.0/
     6.          00      23.45 -23.45 -23.45 -23.45 0.0 -23.45 -23.45 -23.45/
     7.          00      12.00 14.00 13.00 9.00 12.00 9.00 11.00 10.00/
     8.          00      -2.28 2.28 0.02 -0.76 2.28 0.02 0.76 2.28 0.02 2.28 2.28 0.02 -2.28 0.76 0.02
     9.          00      -0.76  0.76 0.02 0.76 0.76 0.02 2.28 0.76 0.02 -2.28 -0.76 0.02 -0.76 -0.76 0.02
    10.          00       0.76 -0.76 0.02 2.28 -0.76 0.02 -2.28 -2.26 0.02 -0.76 -2.28 0.02 0.76 -2.28
    11.          00      0.02 2.28 -2.28 0.02/
    12.          00      1010.48 1006.19 1007.35 1012.13/
    13.          00      4.63 5.56 5.41 3.92/
    14.          00      0.10 0.12 0.09 0.09/

END ELT. ERRORS: NONE. TIME:  1.066 SEC. IMAGE COUNT: 14

*XQT P.ABS
   HELIOSTAT BASE LOCATION AT(   .00,-30.00,    .00)

   OPERATING AT THE                 21, DECEMBER

   SUM. OF SOLAR ENERGY INTO RECEIVER =       73.81

   SUM. OF SOLAR ENERGY OUT OF RECEIVER =        70.90

   HELIOSTAT BASE LOCATION AT(   .00,-30.00,    .00)

   OPERATING AT THE                 21,MARCH

   SUM. OF SOLAR ENERGY INTO RECEIVER =       98.25

   SUM. OF SOLAR ENERGY OUT OF RECEIVER =        72.47

   HELIOSTAT BASE LOCATION AT(   .00,-30.00,    .00)

   OPERATING AT THE                 21,JUNE

   SUM. OF SOLAR ENERGY INTO RECEIVER =      197.86

   SUM. OF SOLAR ENERGY OUT OF RECEIVER =          .00

   HELIOSTAT BASE LOCATION AT(   .00,-30.00,    .00)

   OPERATING AT THE                 21,SEPTEMBER

   SUM. OF SOLAR ENERGY INTO RECEIVER =      106.47

   SUM. OF SOLAR ENERGY OUT OF RECEIVER =        77.18

   HELIOSTAT BASE LOCATION AT( 21.21,-21.21,    .00)

   OPERATING AT THE                 21, DECEMBER

SUM. OF SOLAR ENERGY INTO RECEIVER =      141.21

SUM. OF SOLAR ENERGY OUT OF RECEIVER =        10.5

HELIOSTAT BASE LOCATION AT( 21.21,-21.21,    .00

OPERATING AT THE                 21,MARCH

SUM. OF SOLAR ENERGY INTO RECEIVER =      140.70

SUM. OF SOLAR ENERGY OUT OF RECEIVER =        31.4

HELIOSTAT BASE LOCATION AT( 21.21,-21.21,    .00)

OPERATING AT THE                 21,JUNE

SUM. OF SOLAR ENERGY INTO RECEIVER =      184.09

SUM. OF SOLAR ENERGY OUT OF RECEIVER =        10.40

HELIOSTAT BASE LOCATION AT( 21.21,-21.21,    .00)

OPERATING AT THE                 21,SEPTEMBER

SUM. OF SOLAR ENERGY INTO RECEIVER =      151.68

SUM. OF SOLAR ENERGY OUT OF RECEIVER =        33.50

HELIOSTAT BASE LOCATION AT( 30.00,    .00,    .00)

OPERATING AT THE                 21, DECEMBER

SUM. OF SOLAR ENERGY INTO RECEIVER =      154.17

SUM. OF SOLAR ENERGY OUT OF RECEIVER =        15.33

HELIOSTAT BASE LOCATION AT( 30.00,    .00,    .00)

OPERATING AT THE                 21,MARCH

SUM. OF SOLAR ENERGY INTO RECEIVER =      109.82

SUM. OF SOLAR ENERGY OUT OF RECEIVER =        67.27

HELIOSTAT BASE LOCATION AT( 30.00,    .00,    .00)

OPERATING AT THE                 21,JUNE

SUM. OF SOLAR ENERGY INTO RECEIVER =      154.09

SUM. OF SOLAR ENERGY OUT OF RECEIVER =        32.93
```

HELIOSTAT BASE LOCATION AT(30.00, .00, .00)

OPERATING AT THE 21,SEPTEMBER

SUM. OF SOLAR ENERGY INTO RECEIVER = 118.41

SUM. OF SOLAR ENERGY OUT OF RECEIVER = 72.02

HELIOSTAT BASE LOCATION AT(21.21, 21.21, .00)

OPERATING AT THE 21, DECEMBER

SUM. OF SOLAR ENERGY INTO RECEIVER = 161.28

SUM. OF SOLAR ENERGY OUT OF RECEIVER = 25.75

HELIOSTAT BASE LOCATION AT(21.21, 21.21, .00)

OPERATING AT THE 21,MARCH

SUM. OF SOLAR ENERGY INTO RECEIVER = 193.67

SUM. OF SOLAR ENERGY OUT OF RECEIVER = .00

HELIOSTAT BASE LOCATION AT(21.21, 21.21, .00)

OPERATING AT THE 21,JUNE

SUM. OF SOLAR ENERGY INTO RECEIVER = 122.86

SUM. OF SOLAR ENERGY OUT OF RECEIVER = 58.07

HELIOSTAT BASE LOCATION AT(21.21, 21.21, .00)

OPERATING AT THE 21,SEPTEMBER

SUM. OF SOLAR ENERGY INTO RECEIVER = 197.53

SUM. OF SOLAR ENERGY OUT OF RECEIVER = .00

HELIOSTAT BASE LOCATION AT(.00, 30.00, .00)

OPERATING AT THE 21, DECEMBER

SUM. OF SOLAR ENERGY INTO RECEIVER = 149.79

SUM. OF SOLAR ENERGY OUT OF RECEIVER = 44.29

HELIOSTAT BASE LOCATION AT(.00, 30.00, .00)

OPERATING AT THE 21,MARCH

SUM. OF SOLAR ENERGY INTO RECEIVER = 165.62

SUM. OF SOLAR ENERGY OUT OF RECEIVER = 21.13

HELIOSTAT BASE LOCATION AT(.00, 30.00, .00)

OPERATING AT THE 21,JUNE

SUM. OF SOLAR ENERGY INTO RECEIVER = 121.44

SUM. OF SOLAR ENERGY OUT OF RECEIVER = 57.53

HELIOSTAT BASE LOCATION AT(.00, 30.00, .00)

OPERATING AT THE 21,SEPTEMBER

SUM. OF SOLAR ENERGY INTO RECEIVER = 177.40

SUM. OF SOLAR ENERGY OUT OF RECEIVER = 23.45

HELIOSTAT BASE LOCATION AT(-21.21, 21.21, .00)

OPERATING AT THE 21, DECEMBER

SUM. OF SOLAR ENERGY INTO RECEIVER = 161.25

SUM. OF SOLAR ENERGY OUT OF RECEIVER = 25.75

HELIOSTAT BASE LOCATION AT(-21.21, 21.21, .00)

OPERATING AT THE 21,MARCH

SUM. OF SOLAR ENERGY INTO RECEIVER = 183.57

SUM. OF SOLAR ENERGY OUT OF RECEIVER = .09

HELIOSTAT BASE LOCATION AT(-21.21, 21.21, .00)

OPERATING AT THE 21,JUNE

SUM. OF SOLAR ENERGY INTO RECEIVER = 137.04

SUM. OF SOLAR ENERGY OUT OF RECEIVER = 43.90

HELIOSTAT BASE LOCATION AT(-21.21, 21.21, .00)

OPERATING AT THE 21,SEPTEMBER

SUM. OF SOLAR ENERGY INTO RECEIVER = 157.41

SUM. OF SOLAR ENERGY OUT OF RECEIVER = .10

HELIOSTAT BASE LOCATION AT(-30.00, .00, .00)

OPERATING AT THE 21, DECEMBER

SUM. OF SOLAR ENERGY INTO RECEIVER = 154.17

SUM. OF SOLAR ENERGY OUT OF RECEIVER = 15.33

HELIOSTAT BASE LOCATION AT(-30.00, .00, .00)

OPERATING AT THE 21,MARCH

SUM. OF SOLAR ENERGY INTO RECEIVER = 109.82

SUM. OF SOLAR ENERGY OUT OF RECEIVER = 67.27

HELIOSTAT BASE LOCATION AT(-30.00, .00, .00)

OPERATING AT THE 21,JUNE

SUM. OF SOLAR ENERGY INTO RECEIVER = 154.09

SUM. OF SOLAR ENERGY OUT OF RECEIVER = 32.93

HELIOSTAT BASE LOCATION AT(-30.00, .00, .00)

OPERATING AT THE 21,SEPTEMBER

SUM. OF SOLAR ENERGY INTO RECEIVER = 118.41

SUM. OF SOLAR ENERGY OUT OF RECEIVER = 72.02

HELIOSTAT BASE LOCATION AT(-21.21,-21.21, .00)

OPERATING AT THE 21, DECEMBER

SUM. OF SOLAR ENERGY INTO RECEIVER = 141.21

SUM. OF SOLAR ENERGY OUT OF RECEIVER = 10.59

HELIOSTAT BASE LOCATION AT(-21.21,-21.21, .00)

OPERATING AT THE 21,MARCH

SUM. OF SOLAR ENERGY INTO RECEIVER = 140.70

SUM. OF SOLAR ENERGY OUT OF RECEIVER = 31.47

HELIOSTAT BASE LOCATION AT(-21.21,-21.21, .00)

OPERATING AT THE 21,JUNE

SUM. OF SOLAR ENERGY INTO RECEIVER = 184.09

SUM. OF SOLAR ENERGY OUT OF RECEIVER = 10.40

HELIOSTAT BASE LOCATION AT(-21.21,-21.21, .00)

OPERATING AT THE 21,SEPTEMBER

SUM. OF SOLAR ENERGY INTO RECEIVER = 151.68

SUM. OF SOLAR ENERGY OUT OF RECEIVER = 33.50

TOTAL SOLAR ENERGY INTO RECEIVER = 4743.16

SOLAR FLUX DISTRIBUTION ON APERTURE PLANE 10.X10. M. IN KW/SQ.M.

OPERATING AT THE NOON OF THE 21,MARCH

.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	38.53	269.71	395.53	38.53	.00	.00	.00
.00	.00	.00	151.54	3332.98	3662.34	241.42	.00	.00	.00
.00	.00	.00	92.46	2773.62	5642.20	416.01	.00	.00	.00
.00	.00	.00	.00	333.95	369.68	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00

SOLAR FLUX DISTRIBUTION ON APERTURE PLANE 10.X10. M. IN KW/SQ.M.

OPERATING AT THE NOON OF THE 21,JUNE

.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	383.35	577.34	.00	.00	.00	.00
.00	.00	.00	404.49	4630.95	3064.64	190.19	.00	.00	.00
.00	.00	.00	229.69	3719.54	3821.27	286.00	.00	.00	.00
.00	.00	.00	.00	435.23	218.84	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00

SOLAR FLUX DISTRIBUTION ON APERTURE PLANE 10.X10. M. IN KW/SQ.M.

OPERATING AT THE NOON OF THE 21,SEPTEMBER

.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	40.85	285.95	419.35	40.85	.00	.00	.00
.00	.00	.00	160.67	3533.63	3883.24	255.95	.00	.00	.00
.00	.00	.00	98.02	2940.84	5981.51	491.06	.00	.00	.00
.00	.00	.00	.00	353.82	391.94	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00

SOLAR FLUX DISTRIBUTION ON APERTURE PLANE 10.X10. M. IN KW/SQ.M.

OPERATING AT THE NOON OF THE 21, DECEMBER

.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	31.51	110.37	394.54	31.51	.00	.00	.00
.00	.00	.00	119.68	3052.55	5193.70	119.68	.00	.00	.00
.00	.00	.00	144.84	2288.21	5576.24	144.84	.00	.00	.00
.00	.00	.00	.00	206.59	291.78	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00

3.2 ผลจากโปรแกรมหาปริมาณพลังงานและค่าการแจกแจงความเข้มของรังสี เมื่อใช้ข้อมูลชุดที่ 2 (NCUR = 0)

```
P:NIJ*P7C1C25OL(1).DATA5H
13.74 C.3 3.20 1.75 C.9 3 16 1.0 1C.8/
0.7 2.0 32.0 0.0 0.173648 -0.9848/
8.0 16.0 1.0 1.5 1.5 10/
0.0 -30.0 0.0 21.21 -21.21 0.0 30.0 0.0 0.0 21.21 21.21 0.0 0.0 30.0 0.0 -21.
21.21 0.0 -30.0 0.0 0.0 -21.21 -21.21 0.0/
23.45 -23.45 -23.45 -23.45 0.0 -23.45 -23.45 -23.45/
12.0 14.0 13.0 9.0 12.0 9.0 11.0 10.0/
-2.28 2.28 0.02 -0.76 2.28 0.02 0.76 2.28 0.02 2.28 2.28 0.02 -2.28 0.76 0.02
-0.76 0.76 0.02 0.76 0.76 0.02 2.28 0.76 0.02 -2.28 -0.76 0.02 -0.76 -0.76 0.02
0.76 -0.76 0.02 2.28 -0.76 0.02 -2.28 -2.28 0.02 -0.76 -2.28 0.02 0.76 -2.28
0.02 2.28 -2.28 0.02/
1010.48 1006.19 1007.35 1012.13/
4.63 5.56 5.41 3.92/
0.10 0.12 0.09 0.07/
```

```
@XQT P.AES
HELIOSTAT BASE LOCATION AT(  .00,-30.00,   .00)
OPERATING AT THE                21, DECEMBER
SUM. OF SOLAR ENERGY INTO RECEIVER =      17.70
SUM. OF SOLAR ENERGY OUT OF RECEIVER =    127.07

HELIOSTAT BASE LOCATION AT(  .00,-30.00,   .00)
OPERATING AT THE                21,MARCH
SUM. OF SOLAR ENERGY INTO RECEIVER =      20.10
SUM. OF SOLAR ENERGY OUT OF RECEIVER =    150.68

HELIOSTAT BASE LOCATION AT(  .00,-30.00,   .00)
OPERATING AT THE                21,JUNE
SUM. OF SOLAR ENERGY INTO RECEIVER =     120.45
SUM. OF SOLAR ENERGY OUT OF RECEIVER =     77.49

HELIOSTAT BASE LOCATION AT(  .00,-30.00,   .00)
OPERATING AT THE                21,SEPTEMBER
SUM. OF SOLAR ENERGY INTO RECEIVER =      21.75
SUM. OF SOLAR ENERGY OUT OF RECEIVER =    161.96

HELIOSTAT BASE LOCATION AT( 21.21,-21.21,   .00)
OPERATING AT THE                21, DECEMBER
SUM. OF SOLAR ENERGY INTO RECEIVER =      99.11
SUM. OF SOLAR ENERGY OUT OF RECEIVER =     52.71

HELIOSTAT BASE LOCATION AT( 21.21,-21.21,   .00)
OPERATING AT THE                21,MARCH
SUM. OF SOLAR ENERGY INTO RECEIVER =      58.02
SUM. OF SOLAR ENERGY OUT OF RECEIVER =    114.22

HELIOSTAT BASE LOCATION AT( 21.21,-21.21,   .00)
OPERATING AT THE                21,JUNE
SUM. OF SOLAR ENERGY INTO RECEIVER =      96.99
SUM. OF SOLAR ENERGY OUT OF RECEIVER =    107.61

HELIOSTAT BASE LOCATION AT( 21.21,-21.21,   .00)
OPERATING AT THE                21,SEPTEMBER
SUM. OF SOLAR ENERGY INTO RECEIVER =      63.07
SUM. OF SOLAR ENERGY OUT OF RECEIVER =    122.19

HELIOSTAT BASE LOCATION AT( 30.00,   .00,   .00)
OPERATING AT THE                21, DECEMBER
SUM. OF SOLAR ENERGY INTO RECEIVER =      76.71
SUM. OF SOLAR ENERGY OUT OF RECEIVER =     92.83

HELIOSTAT BASE LOCATION AT( 30.00,   .00,   .00)
OPERATING AT THE                21,MARCH
SUM. OF SOLAR ENERGY INTO RECEIVER =      39.14
SUM. OF SOLAR ENERGY OUT OF RECEIVER =    138.00

HELIOSTAT BASE LOCATION AT( 30.00,   .00,   .00)
OPERATING AT THE                21,JUNE
SUM. OF SOLAR ENERGY INTO RECEIVER =      78.24
SUM. OF SOLAR ENERGY OUT OF RECEIVER =    108.88

HELIOSTAT BASE LOCATION AT( 30.00,   .00,   .00)
OPERATING AT THE                21,SEPTEMBER
```

SUM. OF SOLAR ENERGY INTO RECEIVER = 92.71

SUM. OF SOLAR ENERGY OUT OF RECEIVER = 147.78

HELIOSTAT BASE LOCATION AT(21.21, 21.21, .00)

OPERATING AT THE 21, DECEMBER

SUM. OF SOLAR ENERGY INTO RECEIVER = 68.41

SUM. OF SOLAR ENERGY OUT OF RECEIVER = 118.67

HELIOSTAT BASE LOCATION AT(21.21, 21.21, .00)

OPERATING AT THE 21,MARCH

SUM. OF SOLAR ENERGY INTO RECEIVER = 92.91

SUM. OF SOLAR ENERGY OUT OF RECEIVER = 91.33

HELIOSTAT BASE LOCATION AT(21.21, 21.21, .00)

OPERATING AT THE 21,JUNE

SUM. OF SOLAR ENERGY INTO RECEIVER = 64.98

SUM. OF SOLAR ENERGY OUT OF RECEIVER = 116.04

HELIOSTAT BASE LOCATION AT(21.21, 21.21, .00)

OPERATING AT THE 21,SEPTEMBER

SUM. OF SOLAR ENERGY INTO RECEIVER = 99.33

SUM. OF SOLAR ENERGY OUT OF RECEIVER = 98.27

HELIOSTAT BASE LOCATION AT(.00, 30.00, .00)

OPERATING AT THE 21, DECEMBER

SUM. OF SOLAR ENERGY INTO RECEIVER = 62.98

SUM. OF SOLAR ENERGY OUT OF RECEIVER = 131.14

HELIOSTAT BASE LOCATION AT(.00, 30.00, .00)

OPERATING AT THE 21,MARCH

SUM. OF SOLAR ENERGY INTO RECEIVER = 55.39

SUM. OF SOLAR ENERGY OUT OF RECEIVER = 131.44

HELIOSTAT BASE LOCATION AT(.00, 30.00, .00)

OPERATING AT THE 21,JUNE

SUM. OF SOLAR ENERGY INTO RECEIVER = 33.90

SUM. OF SOLAR ENERGY OUT OF RECEIVER = 145.13

HELIOSTAT BASE LOCATION AT(.00, 30.00, .00)

OPERATING AT THE 21,SEPTEMBER

SUM. OF SOLAR ENERGY INTO RECEIVER = 57.24

SUM. OF SOLAR ENERGY OUT OF RECEIVER = 141.70

HELIOSTAT BASE LOCATION AT(-21.00, 21.21, .00)

OPERATING AT THE 21, DECEMBER

SUM. OF SOLAR ENERGY INTO RECEIVER = 51.71

SUM. OF SOLAR ENERGY OUT OF RECEIVER = 135.48

HELIOSTAT BASE LOCATION AT(-21.00, 21.21, .00)

OPERATING AT THE 21,MARCH

SUM. OF SOLAR ENERGY INTO RECEIVER = 53.42

SUM. OF SOLAR ENERGY OUT OF RECEIVER = 130.43

HELIOSTAT BASE LOCATION AT(-21.00, 21.21, .00)

OPERATING AT THE 21,JUNE

SUM. OF SOLAR ENERGY INTO RECEIVER = 69.71

SUM. OF SOLAR ENERGY OUT OF RECEIVER = 116.40

HELIOSTAT BASE LOCATION AT(-21.00, 21.21, .00)

OPERATING AT THE 21,SEPTEMBER

SUM. OF SOLAR ENERGY INTO RECEIVER = 57.27

SUM. OF SOLAR ENERGY OUT OF RECEIVER = 140.44

HELIOSTAT BASE LOCATION AT(-30.00, .00, .00)

OPERATING AT THE 21, DECEMBER

SUM. OF SOLAR ENERGY INTO RECEIVER = 76.71

SUM. OF SOLAR ENERGY OUT OF RECEIVER = 92.83

HELIOSTAT BASE LOCATION AT(-30.00, .00, .00)

OPERATING AT THE 21,MARCH

SUM. OF SOLAR ENERGY INTO RECEIVER = 39.19

SUM. OF SOLAR ENERGY OUT OF RECEIVER = 138.00

HELIOSTAT BASE LOCATION AT(-30.00, .00, .00)

OPERATING AT THE 21,JUNE

SUM. OF SOLAR ENERGY INTO RECEIVER = 78.29

SUM. OF SOLAR ENERGY OUT OF RECEIVER = 108.88

HELIOSTAT BASE LOCATION AT(-30.00, .00, .00)

OPERATING AT THE 21,SEPTEMBER

SUM. OF SOLAR ENERGY INTO RECEIVER = 92.71

SUM. OF SOLAR ENERGY OUT OF RECEIVER = 147.78

HELIOSTAT BASE LOCATION AT(-21.21,-21.21, .00)

OPERATING AT THE 21, DECEMBER

SUM. OF SOLAR ENERGY INTO RECEIVER = 99.11

SUM. OF SOLAR ENERGY OUT OF RECEIVER = 52.71

HELIOSTAT BASE LOCATION AT(-21.21,-21.21, .00)

OPERATING AT THE 21,MARCH

SUM. OF SOLAR ENERGY INTO RECEIVER = 58.02

SUM. OF SOLAR ENERGY OUT OF RECEIVER = 114.22

HELIOSTAT BASE LOCATION AT(-21.21,-21.21, .00)

OPERATING AT THE 21,JUNE

SUM. OF SOLAR ENERGY INTO RECEIVER = 86.99

SUM. OF SOLAR ENERGY OUT OF RECEIVER = 107.61

HELIOSTAT BASE LOCATION AT(-21.21,-21.21, .00)

OPERATING AT THE 21,SEPTEMBER

SUM. OF SOLAR ENERGY INTO RECEIVER = 83.07

SUM. OF SOLAR ENERGY OUT OF RECEIVER = 122.19

TOTAL SOLAR ENERGY INTO RECEIVER = 2031.69

SOLAR FLUX DISTRIBUTION ON APERTURE PLANE 10.X10. M. IN KW/SQ.M.

OPERATING AT THE NOON OF THE 21,SEPTEMBER

.00	.00	.00	81.78	.00	.00	81.78	.00	.00	.00
.00	.00	157.18	124.28	222.57	451.98	124.28	157.18	.00	.00
48.88	.00	198.38	404.82	486.60	250.43	405.31	439.61	.00	48.88
.00	242.51	382.89	279.09	396.42	385.88	274.03	497.93	128.07	.00
19.09	288.46	291.56	380.03	494.59	373.34	495.07	298.25	402.95	134.07
19.15	288.79	291.07	380.16	495.07	372.86	494.59	298.37	403.37	133.65
.00	242.59	383.01	274.03	385.88	396.42	274.09	497.44	127.95	.00
48.88	.00	198.32	405.31	487.09	250.31	405.22	435.03	.00	48.88
.00	.00	157.18	124.28	222.51	451.64	124.28	157.18	.00	.00
.00	.00	.00	81.78	.00	.00	81.78	.00	.00	.00

SOLAR FLUX DISTRIBUTION ON APERTURE PLANE 10.X10. M. IN KW/SQ.M.

OPERATING AT THE NOON OF THE 21. DECEMBER

.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	11.89	63.02	214.71	310.81	289.97	214.78	63.02	82.90	.00
.00	94.49	97.79	438.62	304.73	182.02	530.52	221.05	23.68	.00
72.03	140.64	420.62	286.92	408.96	408.60	286.55	420.62	303.59	163.74
15.26	194.18	368.11	319.99	506.26	383.55	411.88	399.65	194.39	15.26
15.26	194.07	368.11	320.35	506.62	383.19	411.52	399.65	194.25	15.26
72.21	191.32	420.62	286.55	408.60	408.96	286.97	420.38	303.23	163.56
.00	94.74	97.98	438.55	305.09	181.66	529.83	220.86	23.68	.00
.00	11.99	63.02	214.53	310.45	290.76	214.71	63.02	82.90	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00

SOLAR FLUX DISTRIBUTION ON APERTURE PLANE 10.X10. M. IN KW/SQ.M.

OPERATING AT THE NOON OF THE 21,MARCH

.00	.00	.00	77.14	.00	.00	77.14	.00	.00	.00
.00	.00	148.25	117.22	209.93	426.31	117.22	148.25	.00	.00
46.10	.00	187.11	381.83	458.97	236.21	382.29	409.92	.00	46.10
.00	228.74	361.19	258.52	364.98	363.96	258.46	469.65	120.80	.00
16.01	272.07	275.00	358.95	466.50	352.13	466.96	281.31	380.07	126.96
18.07	272.02	274.54	358.56	466.95	351.68	466.50	281.43	380.46	126.06
.00	229.17	361.25	258.46	363.96	364.98	258.52	469.19	120.69	.00
46.10	.00	187.05	382.29	459.42	236.10	381.83	410.32	.00	46.10
.00	.00	148.25	117.22	210.29	425.97	117.22	148.25	.00	.00
.00	.00	.00	77.14	.00	.00	77.14	.00	.00	.00

SOLAR FLUX DISTRIBUTION ON APERTURE PLANE 10.X10. M. IN KW/SQ.M.

OPERATING AT THE NOON OF THE 21,JUNE

.00	.00	.00	.00	27.95	111.90	.00	.00	.00	.00
.00	.00	121.67	231.39	180.10	319.37	231.68	136.15	.00	.00
.00	109.67	357.95	537.43	202.60	251.88	428.87	264.28	15.67	.00
.00	188.44	462.72	231.24	482.46	463.02	231.24	339.07	376.15	.00
149.72	440.95	121.14	529.62	274.77	324.45	529.15	121.14	277.99	134.69
115.07	371.79	121.14	544.81	224.93	342.95	545.29	121.14	346.52	65.87
.00	188.44	393.90	231.24	551.28	374.20	231.24	299.45	376.12	.00
.00	219.34	248.61	503.25	168.03	286.53	359.22	248.99	31.33	.00
.00	.00	121.58	231.68	145.93	250.43	231.68	136.15	.00	.00
.00	.00	.00	.00	27.95	111.80	.00	.00	.00	.00

ประวัติ

ชื่อ	:	นายพินิจ ศิริพฤกษ์พงษ์
การศึกษา	:	วิศวกรรมศาสตร์บัณฑิตเครื่องกล (เกียรตินิยมอันดับ 1)
สถาบัน	:	สถาบันเทคโนโลยีพระจอมเกล้า วิทยาเขตพระนครเหนือ
ปีการศึกษา	:	2520
ที่ทำงาน	:	แผนกวิทยาการ กองพลังงานพิเศษ ฝ่ายวิทยาการพลังงาน การไฟฟ้าฝ่ายผลิตแห่งประเทศไทย
ตำแหน่ง	:	ผู้ช่วยหัวหน้าแผนกวิทยาการ