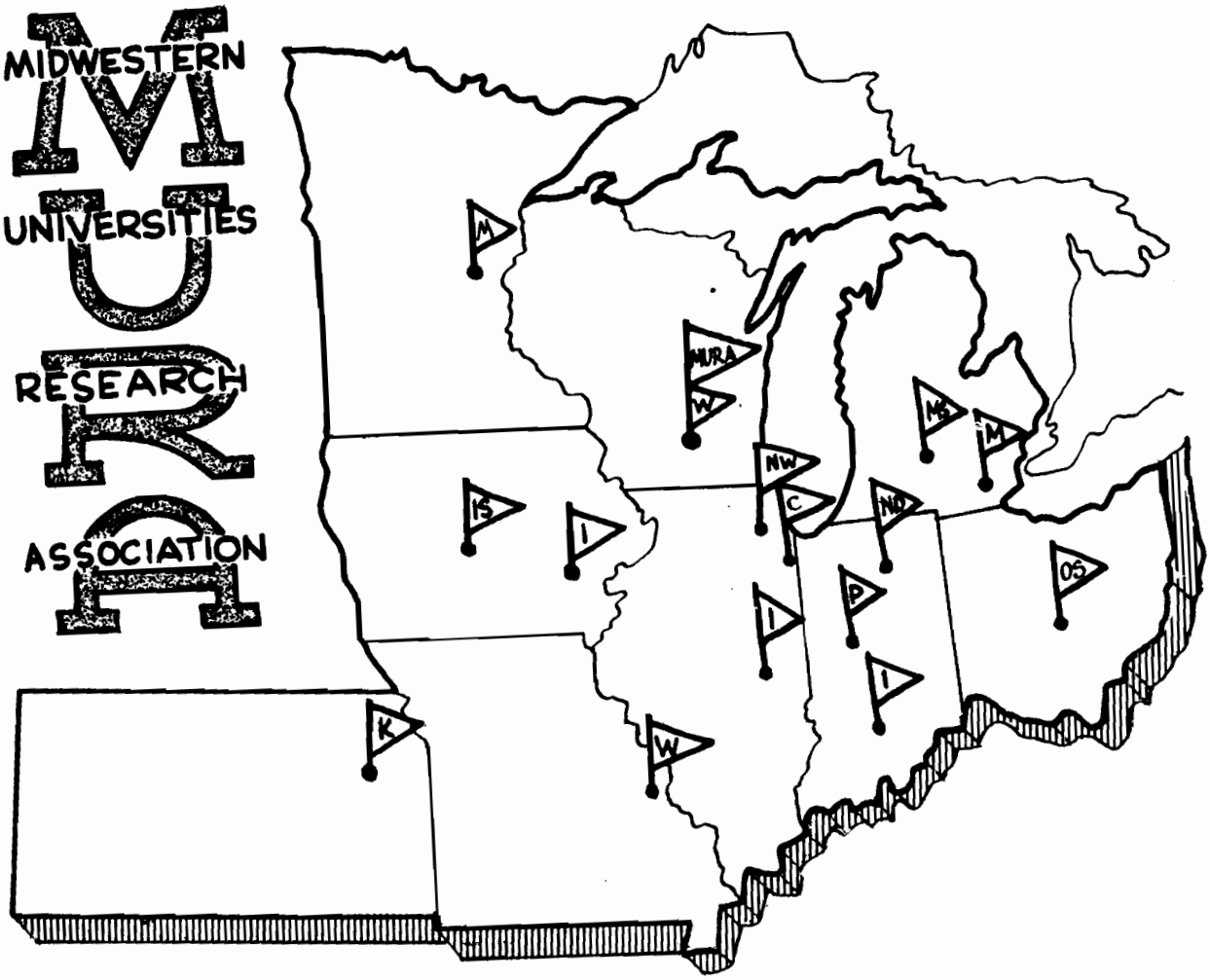
395

Fermilab Library
0 1160 0038710 4

MIDWESTERN UNIVERSITIES RESEARCH ASSOCIATION



REPORT SQUAVE
(Programme 190)
March, 1958

NUMBER 395
Internal
(IBM Program)

SQUAVE

(PROGRAMME NO. 190)

G. A. Westlund

This program was inspired by a memo from G. Parzen to M. Storm dated 10 February 1958. Its object is to investigate the effect of straight sections and bumps on particle motion.

The program integrates the following equations using a floating point Gill-Kutta method:

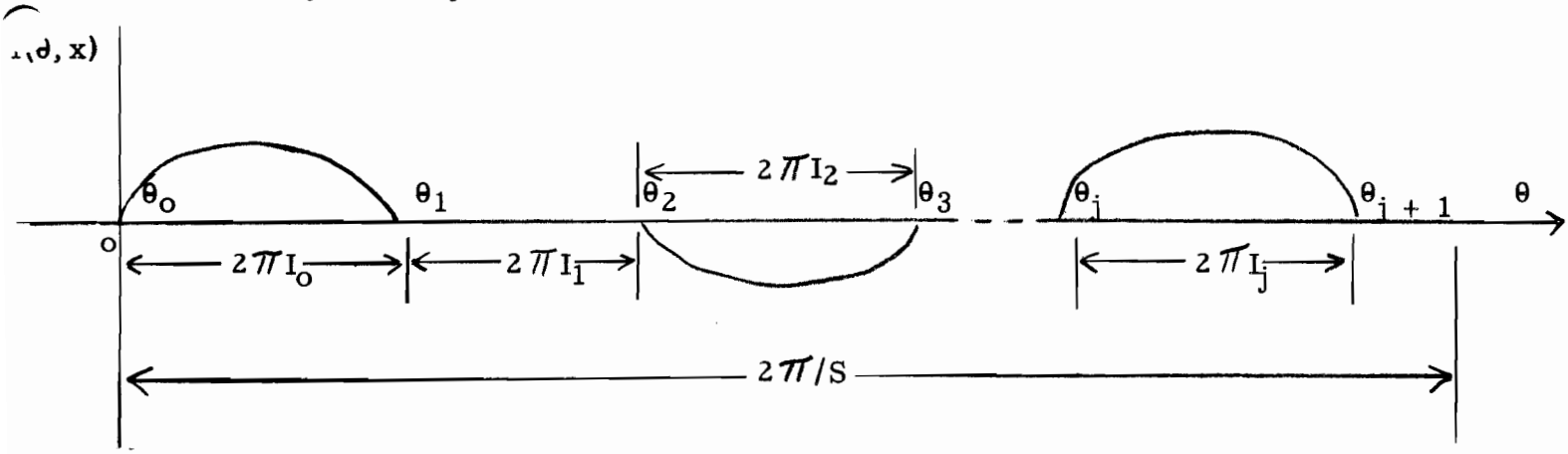
$$\frac{dx}{d\theta} = (1 + x)\frac{p_x}{\sqrt{1 - p_x^2}}, \quad \frac{dp_x}{d\theta} = \sqrt{1 - p_x^2} - (1 + x) H_Z$$

where the magnetic field component H_Z is given by

$$H_Z = (1 + x)^k f(\theta, x)$$

and $f(\theta, x) = a_j \sin(\phi_j - 2\pi\alpha_j) + b_j \sin(3\phi_j - 2\pi\beta_j) + c_j$

when $\theta_j < \theta < \theta_{j+1}$:



and $\phi_j = n_j\left[\theta - \frac{1}{WN} \ln(1 + x)\right]$.

$f(\theta, x)$ has the period $2\pi/S$, $f(\theta + 2\pi/S, x) = f(\theta, x)$.

N_{RK} integration steps are used per effective period $2\pi/N$. Results are printed every N_P steps and the entire run lasts for N_E steps. The counter for N_P may be given an initial value NP_o, so that the first result is printed after $N_P + NP_o$ steps.

The beginning of the supersector, θ_o, must be zero, but integration will start at θ corresponding to $(N\theta/2\pi)_o$.

The standard Search Feature is provided for a series. If sense switch 6 is up, the first run of a series which reaches N_E steps will terminate the series.

The print format of initial conditions is as follows:

00190	N_E	N_{RK}	N_P	NP_o	
00190	S				
00190	x_{max}	p_{xmax}	$1/W$	$(N\theta/2\pi)_o$	k
00190	N				
00000	I_o	n_o	a_o	α_o	
00000	b_o	β_o	c_o		
00001	I_1	n_1	a_1	α_1	
00001	b_1	β_1	c_1		
.					
.					
.					
0000j	I_j	n_j	a_j	α_j	
0000j	b_j	β_j	c_j		

Sample agenda sheets are attached. The program accepts an eleven digit ID number, where ID = (HUMAN ID) 10^8 + RUN ID.

SQUAVE SERIES AGENDUM SHEET

(Programme 190)

To follow and be attached with staples to at least one standard SQUAVE AGENDUM SHEET. If other than the specified quantities change from run to run, use a standard sheet for each run.

Based upon SQUAVE number [ ] as first of series.

INTEGER	FLOATING POINT NUMBERS					
ID NUMBER	x_o		p_{x_o}		$(\frac{N\theta}{2\pi})_o$	
900	911		912		916	

SQUAVE ADDENDUM
(Programme No. 190)

1. All parameters will be zero unless set otherwise (except $x_{max} = p_{xmax} = 1/2$). Do not enter such zeros. If needed, enter $p_{xmax} < 1$.

2. All values are held from run to run. In a series, enter only those parameters which change on subsequent sheets.

3. For backward integration, replace N_{RK} with $-N_{RK}$.

4. For application of the search feature (SS6 up), check box: ☐

PAR.	ADD	VALUE	PAR.	ADD	VALUE	PAR.	ADD	VALUE	PAR.	ADD	VALUE
ID	900		N_{RK}	903		NP_o	905				
N_E	902		N_P	904		S	907		--	1	END INTEGERS

PAR.	ADD	VALUE	EXP	PAR.	ADD	VALUE	EXP	PAR.	ADD	VALUE	EXP	PAR.	ADD	VALUE	EXP
x_o	911			k	906			p_{xmax}	914			1/W	915		
p_{x_o}	912			x_{max}	913			N	901			$\left(\frac{N\theta}{2\pi}\right)_o$	916		

j	I		n		a		α		b		β		c	
0														
1														
2														
3														
4														
5														
6														
7														
8														
9														
10														
11														
12														
13														
14														

SQUAVE AGENDUM (Programme No. 190)

j	l	n	a	α	b	β	c