

APPENDIX 3D

DETAILS OF STADIUM NOISE IMPACT ASSESSMENT

APPENDIX A3.4

REPORT ON STADIUM NOISE MONITORING

1. INTRODUCTION

Subsequent to the proposal "Proposal for Stadium Noise Monitoring", this report present the actual programme, methodologies, results and findings for the monitoring conducted between 23 and 24 February 2001 at Fukuoka Dome in Japan.

Details of the technical information are presented in the following appendices:

Appendix A	Monitoring data and graphs
Appendix B	Noise measurement results inside the Dome from Takenaka
Appendix C	Sound transmission loss information for retractable roof supplied by Mitsubishi
Appendix D	Noise measurement results for Michael Jackson Concert in Fukuoka Dome supplied by Mitsubishi/Takenaka
Appendix E	Photo records of site conditions

2. MONITORING EVENTS

Monitoring was carried out under various constraints on site. The key events of this monitoring programme were:

23 Feb am/pm	site inspection and identify appropriate monitoring locations
23 Feb evening	background noise monitoring
24 Feb am	supplementary background noise monitoring
24 Feb pm	supplementary background noise monitoring
24 Feb evening	Concert noise impact monitoring

3. NOISE MONITORING METHODOLOGIES

3.1 Target of Monitoring

The target of monitoring was a rock concert performed by Japanese artist "Judy and Mary" on 24 February 2001 at Fukuoka Dome.

Events of the Concert:

- The concert started at 18:45 and ended at 21:09.
- Some fireworks (small explosions) at 18:55 at the stage
- Performer talked with no music during 19:38 to 19:43
- Rock music with audiences standing all time
- The retractable roof was closed during the concert

3.2 Monitoring Methodology

Monitoring Locations

I) Location M1-H

Location M1-H was at the terrasse of a hotel room at 29/F of Sea Hawk Hotel facing the retractable roof portion of the Dome. Due to the influence by strong winds, two measurement points were set up at the east façade(M1-HE) and the south façade(M1-HS).

II) Location M1-L

Location M1-L was at 7/F level on the podium of the shopping mall of Sea Hawk Hotel.

III) Inside the Stadium

Since noise measurement was declined by the organiser of the concert, a representative of the monitoring team was observing the concert at a seat near the 3rd base of the baseball pitch.

IV) Spot checking

A representative of the monitoring team was walking around, inside and outside the Dome to observed any noise events or noise sources.

Monitoring locations are illustrated in **Figure 3.1**.

Table 3.1 Summary of Monitoring Locations

Monitoring Station	Objectives	Proposed location	Monitoring parameter
M1-L	Collect noise data outside the Dome Record any other noise sources during the monitoring events This point was the closer point to the retractable roof but the level was slightly lowered than the retractable roof. Approx. 90m from the retractable roof.	At Sea Hawk Hotel, 7/F on the podium of the shopping mall 1.2m above ground, free field measurement.	Leq, Lmax, L90, L10 1/3 Octave band analysis
M1-H	Collect noise data outside the Dome Record any other noise sources during the monitoring events	At Sea Hawk Hotel, at a room at 29/F 1m from external façade of the hotel wall Two facades facing east (M1-HE) and facing south (M1-HS) were used for noise measurement due to strong wind.	Leq, Lmax, L90, L10 1/3 Octave band analysis

Monitoring Equipment

Sound level meters in compliance with the International Electrotechnical Commission Publications 651: 1979 (Type 1) and 804: 1985 (Type 1) specifications were used for carrying out the noise monitoring. Immediately prior to and following each noise measurement the accuracy of the sound level meter were checked using an acoustic calibrator generating a known sound pressure level at a known frequency. All measurements were accepted as valid since the calibration levels from before and after the noise measurement agree to within 1.0dB.

The equipment used included:

- Two Rion NA-27 Sound Level Meters with octave band analysis
- Two Rion NL-14 Sound Level Meters
- One Rion NA-18 Sound Level Meter

A wind monitor was used to check wind speed at intervals.

4. MONITORING RESULTS

4.1 Selection of Monitoring Locations

The inspection of potential monitoring locations was carried out on 23 February 2001 with the assistance from the representative of Mitsubishi. The following locations were inspected but failed due to respective reasons:

- Location inside the Dome (outside and near the roof of the retractable roof, and at the audience level) – this was declined by the concert organiser
- Location at mid-level of Sea Hawk Hotel – hotel room was not available on the date 24 February 2001

Finally, the following locations were possible for monitoring:

- Location on the podium at 7/F level of Sea Hawk Hotel (M1-L)
- Location at a hotel room at 29/F of Sea Hawk Hotel (M1-HE, M1-HS)

4.2 Noise Environment

The surrounding noise environment was inspected and the major noise sources were identified as:

1. Fukuoka City Highway – The highway was in dual-two configuration with a speed limit of 60km/hr. There were no noise barriers along the sides near the Dome. Some traffic counts were carried out during the monitoring.
2. Local roads -There were local roads surrounding the Dome. The nearest was the one running along the south side of Sea Hawk Hotel and some traffic counts were conducted during the monitoring.
3. Announcement systems and loudspeaker at entrance level of the Dome – Some of them are public announcement systems. Some belonged to the shops broadcasting music.

4.3 Background Noise Monitoring on 23 February 2001

Two monitoring locations were set up aimed to measure the background noise monitoring at similar time period to the concert:

1. M1-HE
2. M1-L

The monitoring was started at 17:54. The weather was changing adversely as a cold front was passing southern Japan. The wind speed as measured was around 2 to 4 m/s around 18:00 and

it changed its direction from SSW to N and NNE together with a sudden rise in speed to 12 m/s. Scattered rains and latter showers also came.

Noise measurements were interrupted due to high wind speed and rains after 18:30.

The measurement results were meaningful for period before 18:30 while measurement conditions were still acceptable. Results are summarised as follows:

Table 4.1 Summary of Results for Background Noise Monitoring on 23 Feb 2001

Monitoring Location	Time	Leq (5min)	Lmax (5min)	Lmin (5min)	L10 (5min)	L90 (5min)
M1-L	18:12 – 18:27	59.2 - 63.4 Avg: 61.8	73.5 – 74.8	53.6 – 57.8	60.6 – 66.5	56.7 – 59.4
M1-HE	17:54 – 18:19	61.9 – 64.9 Avg: 62.4	65.3 – 75.3	58.3 – 59.2	62.1 – 67.7	59.8 – 61.5

Note: all sound pressure levels are in dB(A) unless otherwise specified.

One vehicle count was done around 08:30 for Fukuoka City Highway. The 5 min vehicle counts were 105 veh/5min for west bound and 144 veh/5min for east bound.

4.4 Background Noise Monitoring on 24 February 2001

Owing to the adverse weather for noise measurement on 23 February, additional background noise monitoring were carried out in the morning and afternoon on 24 February.

24 February Morning

One relatively sheltered location M1-HS, the southern façade of the terrasse of hotel room at 29/F was selected for monitoring. The eastern façade was affected by wind speed >5m/s. There were also scattered rains during the morning periods.

Table 4.2 Summary of Results for Background Noise Monitoring on 24 Feb 2001 Morning

Monitoring Location	Time	Leq (5min)	Lmax (5min)	Lmin (5min)	L10 (5min)	L90 (5min)
M1-HS	10:34 – 11:39	61.4 – 62.3 Avg: 61.9	65.9 – 70.3	57.2 – 59.6	62.4 – 63.8	59.9 – 60.8

Note: all sound pressure levels are in dB(A) unless otherwise specified.

It was observed that the dominant noise was from the road traffic of Fukuoka City Highway and local roads. During the period, the traffic count at the Highway was around 174 veh/5min with 9% heavy vehicles. For the nearest local road, it was about 85 veh/5min with 11% heavy vehicles mainly buses.

24 February Afternoon

Similar to the morning setup, Location M1-HS was monitored. The eastern façade was still affected by wind speed >5m/s. There were also scattered rains during the period.

Table 4.3 Summary of Results for Background Noise Monitoring on 24 Feb 2001 Afternoon

Monitoring Location	Time	Leq (5min)	Lmax (5min)	Lmin (5min)	L10 (5min)	L90 (5min)
MI-HS	13:25 – 14:30	61.3 – 63.6 Avg: 61.8	66.7 – 84.2	58.3 – 59.3	62.3 – 64.7	59.9 – 60.5

Note: all sound pressure levels are in dB(A) unless otherwise specified.

It was observed that the dominant noise was from the road traffic of Fukuoka City Highway and local roads. During the period, the traffic count at the Highway was around 160 veh/5min with 13% heavy vehicles. For the nearest local road, it was about 111 veh/5min with 10% heavy vehicles mainly buses. There was a queue forming leading to the Dome (probably the carpark). Slight increase in noise level was due to car horn.

4.5 Noise Monitoring during the Concert Period

Monitoring setup was as follows:

Fixed Locations

1. Location M1-HE
2. Location M1-HS 1/3 octave band analysis with recording by a MD recorder
3. Location M1-L 1/3 octave band analysis

Spot checking was performed by the monitoring team during the monitoring period.

Table 4.4 Summary of Results for Concert Period Monitoring

Monitoring Location	Time	Leq (5min)	Lmax (5min)	Lmin (5min)	L10 (5min)	L90 (5min)
Before the Concert						
M1-HS	17:01 – 18:41	61.4 – 64.7 Avg: 62.2	67.8 – 82.2 Avg: 74.3	58.5 – 59.8 Avg: 59.3	62.7-67.7 Avg: 63.7	59.9 – 61.3 Avg: 60.7
M1-HE*	18:02 – 18:42	62.5 – 64.2 Avg: 63.2	67.7 – 73.7 Avg: 71.6			
M1-L	17:38 – 18:43	58.2 – 59.6 Avg: 59.0	62. – 74.9 Avg: 67.4	56.6 – 57.5 Avg: 57.1	58.9 – 60.9 Avg: 59.9	57.6 – 58.5 Avg: 58.2
During the Concert						
M1-HS	18:46 – 21:11	60.6 – 62.8 Avg: 61.5	65.0 – 76.8 Avg: 72.3	57.8 – 59.3 Avg: 58.5	61.5-64.3 Avg: 62.6	59.3 – 60.8 Avg: 60.1
M1-HE*	18:42 – 21:12	61.9 – 68.0 Avg: 64.2	66.4 – 79.3 Avg: 73.1			
M1-L	18:43 – 21:08	58.4 – 62.2 Avg: 59.6	62.5 – 77.0 Avg: 70.2	55.9 – 58.2 Avg: 57.2	59.2 – 64.6 Avg: 60.9	57.6 – 59.6 Avg: 58.4
After the Concert						
M1-HS	21:11 – 22:16	61.5 – 64.6 Avg: 63.1	69.2 – 86.8 Avg: 77.9	58.0 – 61.5 Avg: 60.1	62.5-65.7 Avg: 64.3	59.8 – 62.7 Avg: 61.5
M1-HE*	21:12 – 22:22	66.8 – 71.0 Avg: 68.6	73.5 – 86.9 Avg: 78.7			
M1-L	21:08 – 22:03	60.5 – 62.8 Avg: 61.4	64.6 – 74.8 Avg: 70.6	57.6 – 59.5 Avg: 58.5	61.6 – 64.3 Avg: 62.7	59.5 – 60.8 Avg: 59.9

Note: all sound pressure levels are in dB(A) unless otherwise specified.

*Noise measurement affected by strong wind >5m/s, some record noise was due to wind, results not reliable.

The monitoring was started at 17:01, well before the concert started and ended at 22:22 about an hour after the concert.

Before the concert started, the audience started to enter the Dome. There were queues at different entry gates. The operator used hand-held loudspeakers as well as the public announcement system at the peripheral of the Dome to guide the audiences.

There were also long queues of vehicles along the local roads waiting for the carpark entry. Noise from car horns was significant.

After the concert started, background noise dropped slightly as the queues and crowds were disappeared.

At location M1-H at 29/F, the monitoring team observed that the music from the concert could not be heard when standing at the measurement location. It was noticed at first that there was some minute music heard. Upon investigation, the music was repeatedly broadcasted from a loudspeaker at the entrance of a bar. Since even such minute sound could be heard at the 29/F monitoring point, it was confident that noise from the concert inside the Dome was barely noticeable.

Several observers/visitors for this monitoring exercise present also claimed that they could not hear any noise from the Dome. However, there were one or two incidences when noise from the concert crowd was noticed faintly with focused attention.

The monitoring team also carried out checking around Dome. It was observed that the door of the gate entrance was acoustically sealed. Noise from the concert was not noticed outside. Only some music from the loudspeakers hanging around the entrance level was noted.

Comparing the monitoring results at M1-HS, the noise level during the concert was L_{eq} 61.5 dB(A) overall during the entire concert period. (Please also see the Appendix A for noise variations during different periods.) This is similar to background readings obtained so far, L_{eq} 61.9 dB(A) on 24/2 am, L_{eq} 61.8 on 24/2 pm, L_{eq} 62.2 dB(A) before the concert, L_{eq} 63.1 db(A) after the concert.

Comparing the monitoring results at M1-L, the noise level during the concert was L_{eq} 59.6 dB(A) overall during the entire concert period (Please also see the Appendix A for noise variations during different periods.) The position was closed to the Dome but was slightly lower than the retractable roof portion and was relatively shielded from traffic noise. Similar noise levels were obtained compared to measurement results without the concert. Noise from concert was not noticed during the monitoring period as revealed by the monitoring team.

Based on the measured background noise levels, the noise levels recorded during the concert period were far less than [background + 5dB(A)], which would meet EPD's criteria on entertainment noise for period 07:00 - 23:00.

4.6 Noise Level inside the Dome

Events of the Concert:

- The concert started at 18:45 and ended at 21:09.
- Some fireworks (small explosions) at 18:55 at the stage
- Performer talked with no music during 19:38 to 19:43
- Rock music with audiences standing all time

The retractable roof was closed during the concert.

The Stage was setup at the spectator area near Gate 7 (with the back facing the Hotel) and was a fixed stage with three sides of audience seats. The sound system was observed to have two main loudspeaker systems at the left and right sides of the stage, with three auxiliary systems locating in a fan like arrangement in near the middle of the baseball pitch. **Figure 4.1** is a schematic diagram showing the observed setup.

A public announcement system was observed at the top of the roof right in the middle of the Dome. The system only used before the concert for announcement only.

Since the concert organiser had declined the noise measurement request, no noise measurement was carried out by the monitoring team.

Some indicative measurement was carried out by the assistance of Takenaka Corporation. The results showed that spontaneous readings between 96 to 105 dB(A) were recorded at a location between home base and the fence. The only $L_{eq}(5min)$ reading was 100.5 dB(A). The details are given in **Appendix B**.

The monitoring team had been present in the concert and observed that the music was "very noisy". The noise level difference between the higher level and lower level of the audience stand was observed quite small.

4.7 Other Technical Information

There are two documents supplied by Mitsubishi/Takenaka relating to the retractable roof materials and a noise measurement carried out for Michael Jackson Concert in Fukuoka Dome. They are copied to **Appendices C and D** respectively for reference.

Regarding the retractable roof, the sound transmission loss information revealed that the transmission loss was ranged from 37.5 dB to 66.9 dB for materials roof, partition panel, eaves ceiling, gable sidewall, active seal, passive seal. Such estimated level of sound transmission loss was anticipated able to reduce the noise from the Dome for rock concert. A point to note is that the transmission loss is low for low frequencies noise compared to high frequencies noise.

The results of noise measurement for Michael Jackson Concert showed that noise was either not heard or masked. One location reported faintly heard for low frequency noise. Noise levels measured were around 45-52dB(A) and 49-60 dB(A) for two locations and both of them were from background noise. The measurement concluded that "*The noise level in Fukuoka Dome in the concert of this time was about 90-100dB(A) excluding fireworks. It is judged that there is no influence in the surrounding at such a noise level at all.*"

5. FINDINGS AND CONCLUSIONS

The monitoring results showed that the noise levels measured outside the Dome were similar to the background noise levels and there was no significant increase during the concert.

This is further supported by the observation that noise from the concert inside the Dome was barely noticeable at both monitoring locations and around the Dome at entrance level.

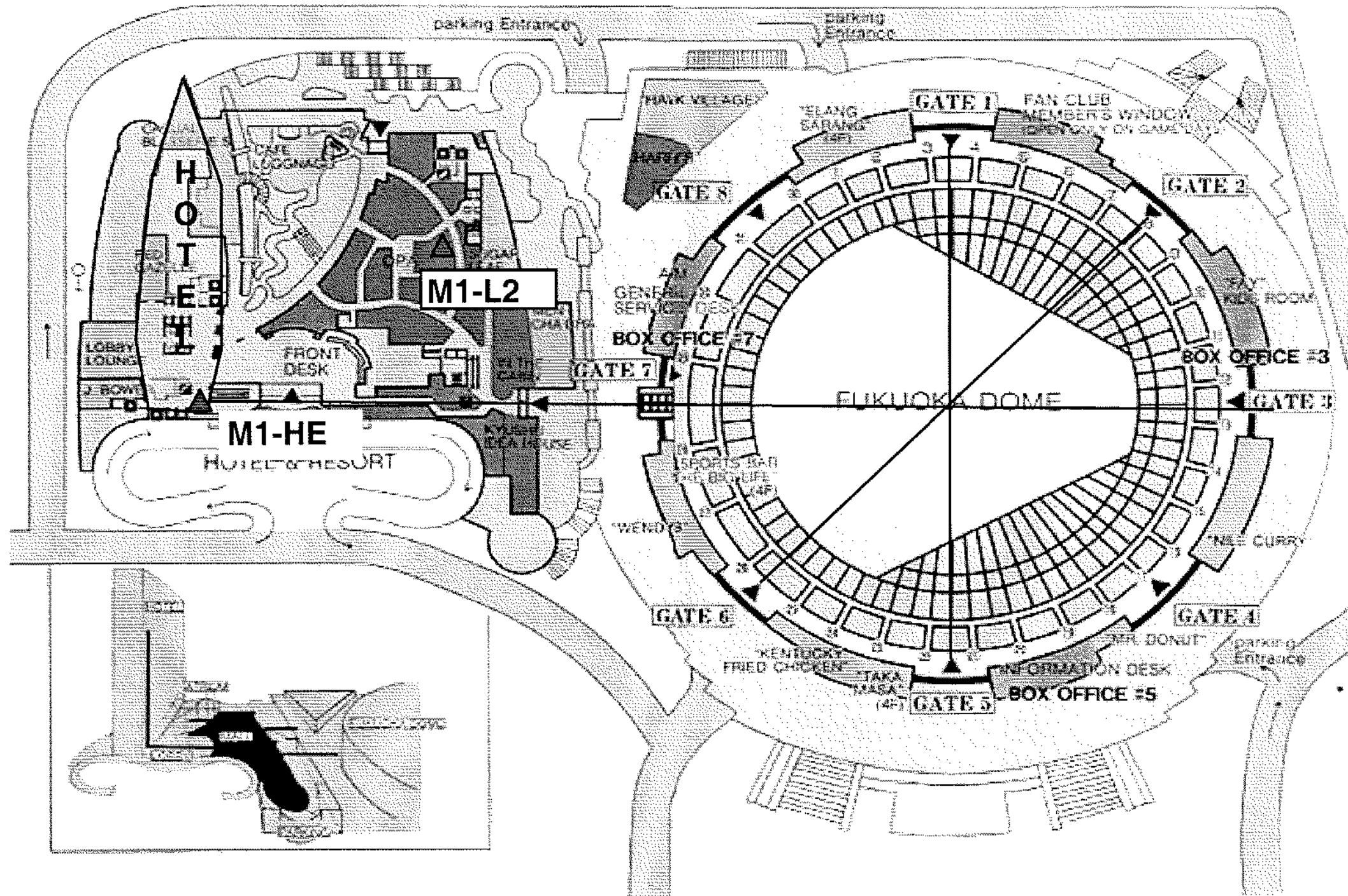
Technical information supplied by Mitsubishi/Takenaka indicated that a fairly high transmission loss could be achieved by the retractable roof. The noise from similar Michael Jackson Concert was also not affecting the surrounding receivers.

Based on the measured background noise levels, the noise levels recorded during the concert period were far less than [background + 5dB(A)], which would meet EPD's criteria on entertainment noise for period 07:00 - 23:00.

Considering the similar design could be applicable to the proposed stadium in SEKD, insurmountable impact would not be expected at this planning and feasibility study stage, while the later detailed design could explore the details of noise reduction measures.

Figure 3.1

Noise Monitoring Locations



Please refer to photos for actual locations and settings

APPENDIX A

MONITORING DATA AND GRAPHS

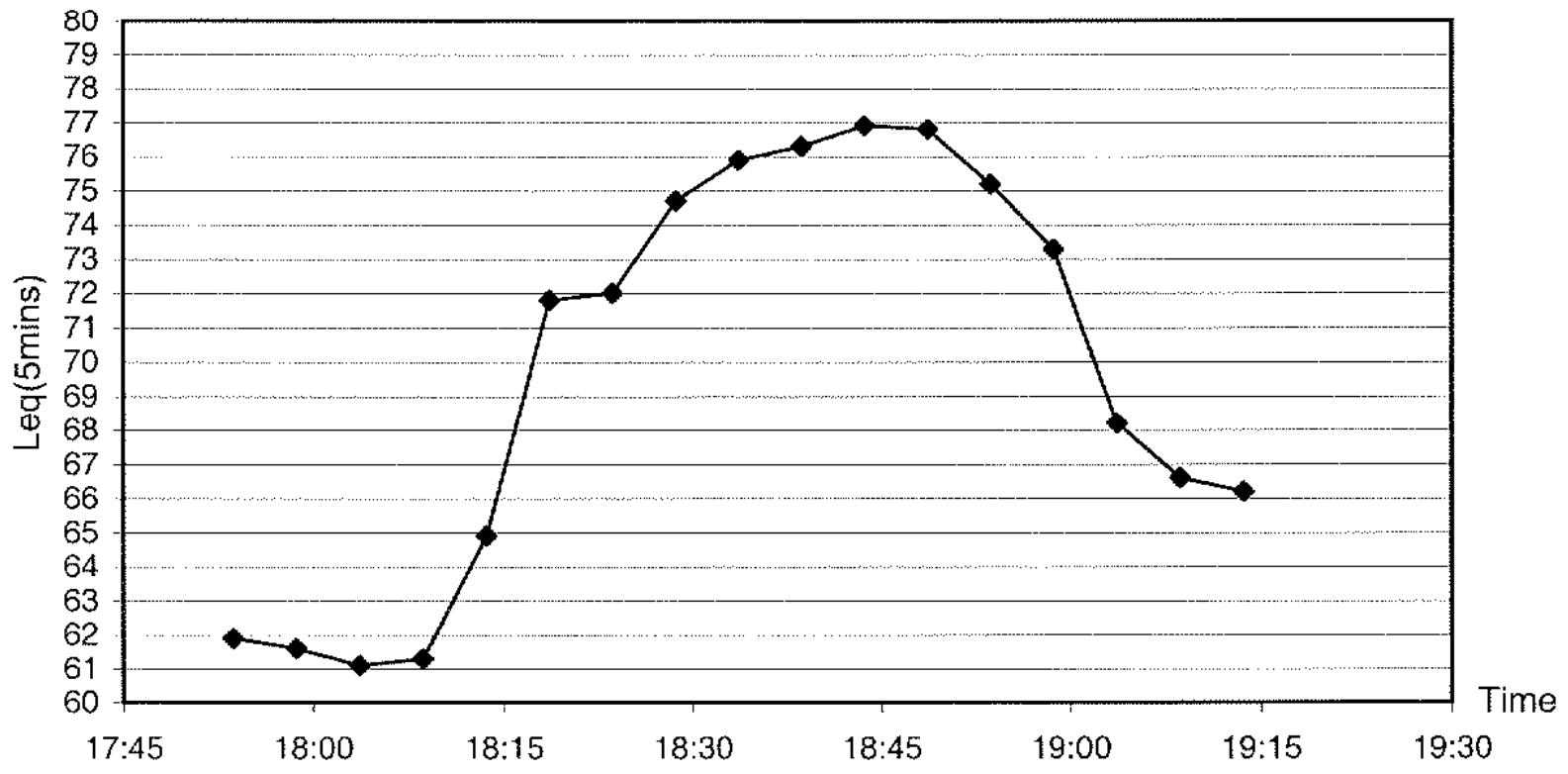
SEKDFS
 STADIUM NOISE MONITORING
 FEB 2001
 Location M1-HE
 23 February 2001

Monitoring Location	M1-HE, 29/F Sea Hawk Hotel, Fukuoka
Date of Monitoring	23-Feb-01
Weather Condition	Cloudy, windy and rainy
Measurement Start Time (hh:mm)	17:54
Measurement Time Length (min.)	85mins
Measurement Duration	5mins interval
Noise Meter Model/Identification	Rion NA-27 (mode of record: 1/3 octave band frequency analysis)
Calibrator Model/Identification	Rion NC-73
Measurement Results	
Leq (dB(A))	see attached.
Lmax (dB(A))	
Lmin (db(A))	
Major Noise Source(s) During Monitoring	Traffic noise from road south to the dome
Other Noise Source(s) During Monitoring	Intermittent noise of ambulance
Remarks	

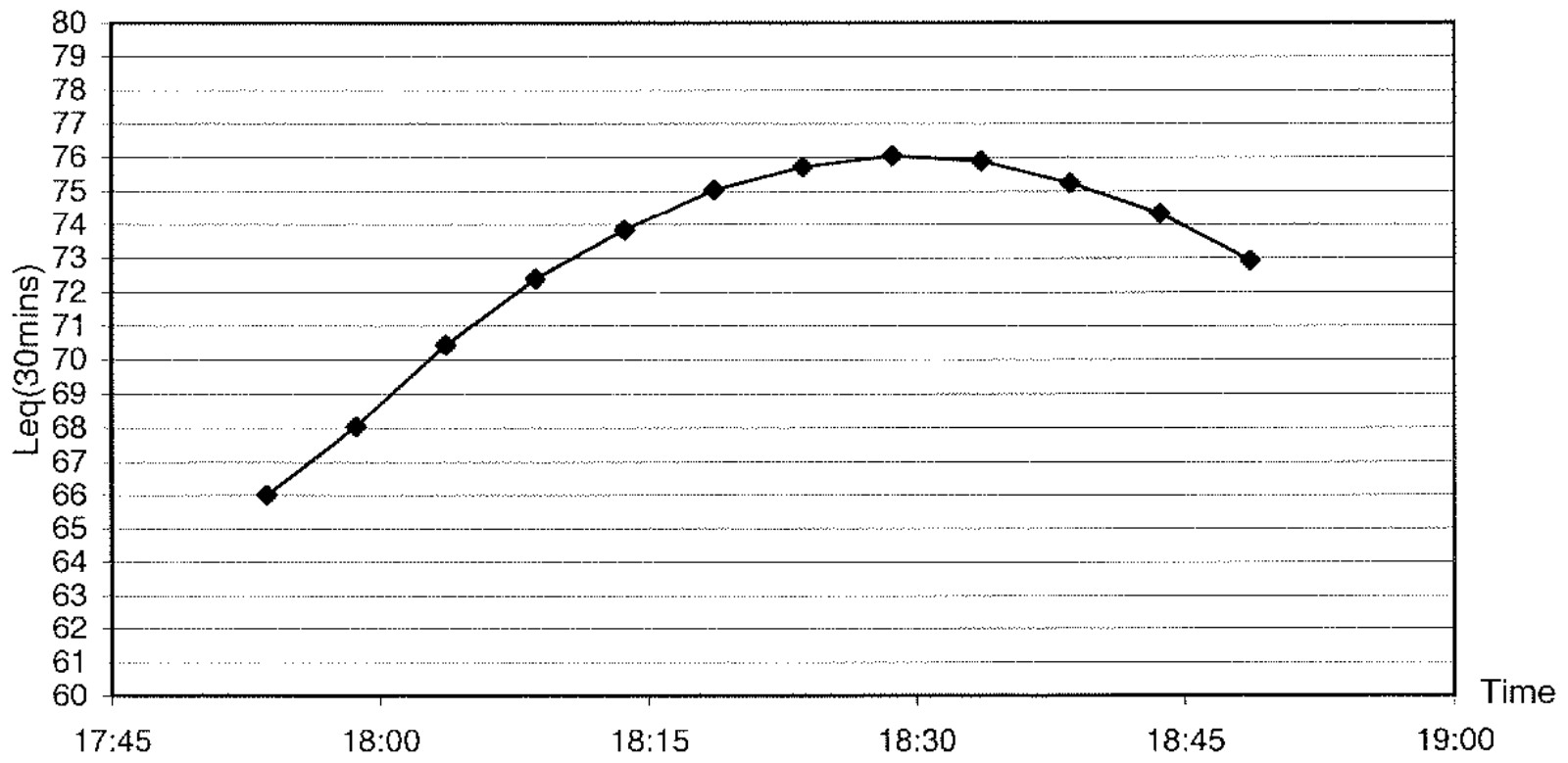
SEKDFS
 STADIUM NOISE MONITORING
 FEB 2001
 Location M1-HE
 23 February 2001

Record No.	Measuring Time		Time	Wind speed	Wind direction (outside)	Leq (5mins)	Leq (30mins)	Lmax	Lmin	L10	L90	Event
	From (hh:mm)	To (hh:mm)										
1	17:54	17:59	1754	4m/s	SSW	61.9	66.0	68.2	58.4	63.7	60.1	
2	17:59	18:04				61.6	68.0	65.3	58.3	62.9	60.0	ambulance horn
3	18:04	18:09				61.1	70.4	67.2	58.3	62.6	59.9	motor engine noise
4	18:09	18:14	1809	2m/s	SSW	61.3	72.4	72.2	58.4	62.1	59.8	ambulance horn, motor engine noise
5	18:14	18:19				64.9	73.8	75.3	59.2	67.7	61.5	
6	18:19	18:24				71.8	75.0	77.7	64.3	74.3	68.1	strong wind sound
7	18:24	18:29	1824	12m/s	N	72.0	75.7	78.6	63.7	74.2	68.7	
8	18:29	18:34				74.7	76.0	81.8	63.8	77.5	70.0	
9	18:34	18:39				75.9	75.9	83.2	68.1	78.2	72.9	
10	18:39	18:44	1839	13m/s	NNE	76.3	75.2	82.8	65.8	78.5	72.7	
11	18:44	18:49				76.9	74.3	83.1	68.7	79.2	74.0	
12	18:49	18:54				76.8	72.9	83.5	70.4	78.6	74.5	
13	18:54	18:59	1854	12m/s	NNE	75.2		82.6	67.1	76.9	71.5	
14	18:59	19:04				73.3		80.3	65.4	75.8	69.6	
15	19:04	19:09				68.2		76.6	61.6	70.2	65.1	
16	19:09	19:14	1909	9m/s	NE	66.6		72.8	62.9	67.8	65.4	
17	19:14	19:19				66.2		74.8	63.2	67.7	64.6	
					average	72.7	73.8					

Background noise measurement results at 29/F Sea Hawk Hotel,
Fukuoka on 23Feb2001



Background noise measurement results at 29/F Sea Hawk Hotel,
Fukuoka on 23Feb2001



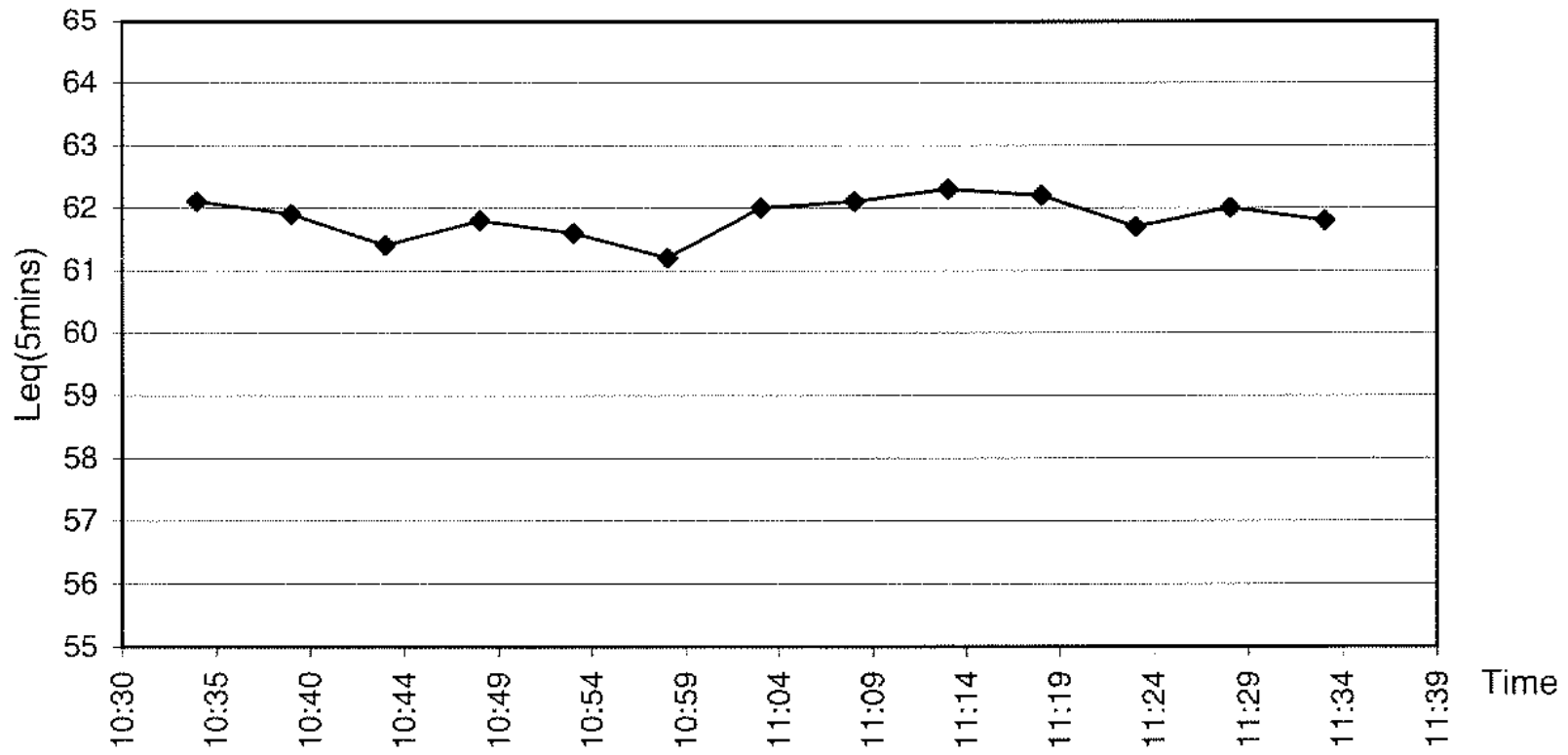
SEKDFS
STADIUM NOISE MONITORING
FEB 2001
Location M1-HS
24 February 2001 am

Monitoring Location	M1-HS, 29/F Sea Hawk Hotel, Fukuoka
Date of Monitoring	24-Feb-01
Weather Condition	Cloudy, occasional showers/drizzles
Measurement Start Time (hh:mm)	10:34
Measurement Time Length (min.)	1hr
Measurement Duration	5mins interval
Noise Meter Model/Identification	Rion NA-27 (mode of record: 1/3 octave band frequency analysis)
Calibrator Model/Identification	Rion NC-73
Measurement Results	See attached.
Leq (dB(A))	
Lmax (dB(A))	
Lmin (db(A))	
Major Noise Source(s) During Monitoring	Traffic noise from road south to the dome
Other Noise Source(s) During Monitoring	
Remarks	

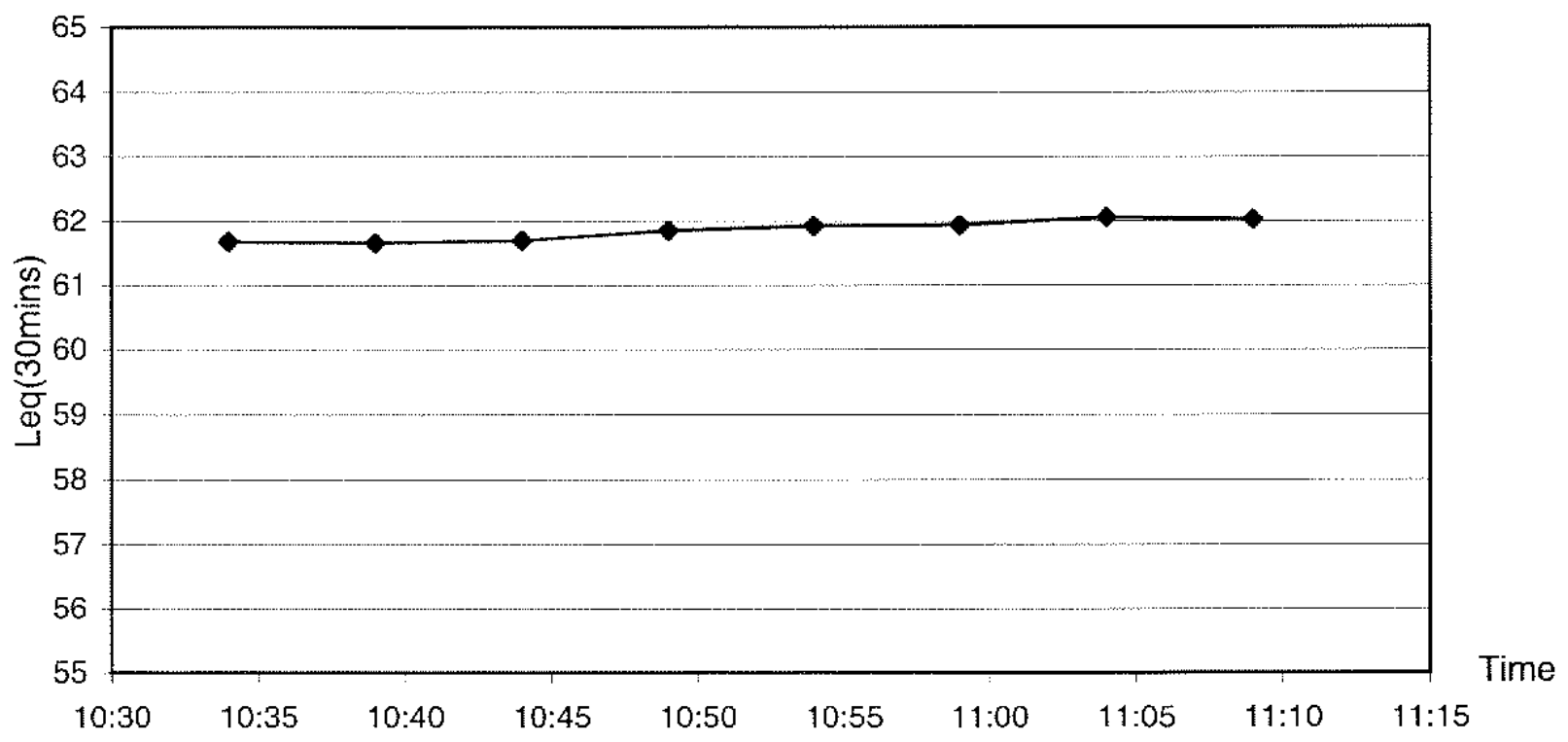
SEKDFS
 STADIUM NOISE MONITORING
 FEB 2001
 Location M1-HS
 24 February 2001

Record No.	Measuring Time		Time	Wind speed	Wind speed (outside)	Wind direction (outside)	Leq (5mins)	Leq (30mins)	Lmax	Lmin	L10	L90	Event
	From (hh:mm)	To (hh:mm)											
1	10:34	10:39	1033	1m/s	10m/s	NE	62.1	61.7	67.3	59.0	63.5	60.7	car horn; car braking
2	10:39	10:44					61.9	61.7	68.5	58.9	63.3	60.4	car braking; car engine noise
3	10:44	10:49					61.4	61.7	66.7	58.6	62.9	59.9	car engine noise
4	10:49	10:54	1049	<1m/s		NE	61.8	61.8	67.5	58.3	63.3	60.2	
5	10:54	10:59					61.6	61.9	66.4	58.8	62.9	60.3	car engine noise; motorcycle noise
6	10:59	11:04					61.2	61.9	65.9	58.6	62.4	60.1	car braking
7	11:04	11:09	1104	<1m/s		NE	62.0	62.1	68.4	58.9	63.5	60.4	car braking
8	11:09	11:14					62.1	62.0	70.3	58.8	63.5	60.4	
9	11:14	11:19					62.3		67.6	59.6	63.7	60.8	
10	11:19	11:24	1119	2m/s		NNE	62.2		67.9	58.5	63.8	60.2	
11	11:24	11:29					61.7		66.6	57.2	63.6	60.0	car horn
12	11:29	11:34					62.0		68.4	58.8	63.4	60.5	car horn
13	11:34	11:39	1134	2m/s		NNE	61.8		66.5	59.1	63.0	60.6	car braking
14													
15													
16													
17													
average							61.9	61.9					

Background noise results at M1-HS, Fukuoka on 24Feb2001



Background noise results at M1-HS, Fukuoka on 24Feb2001

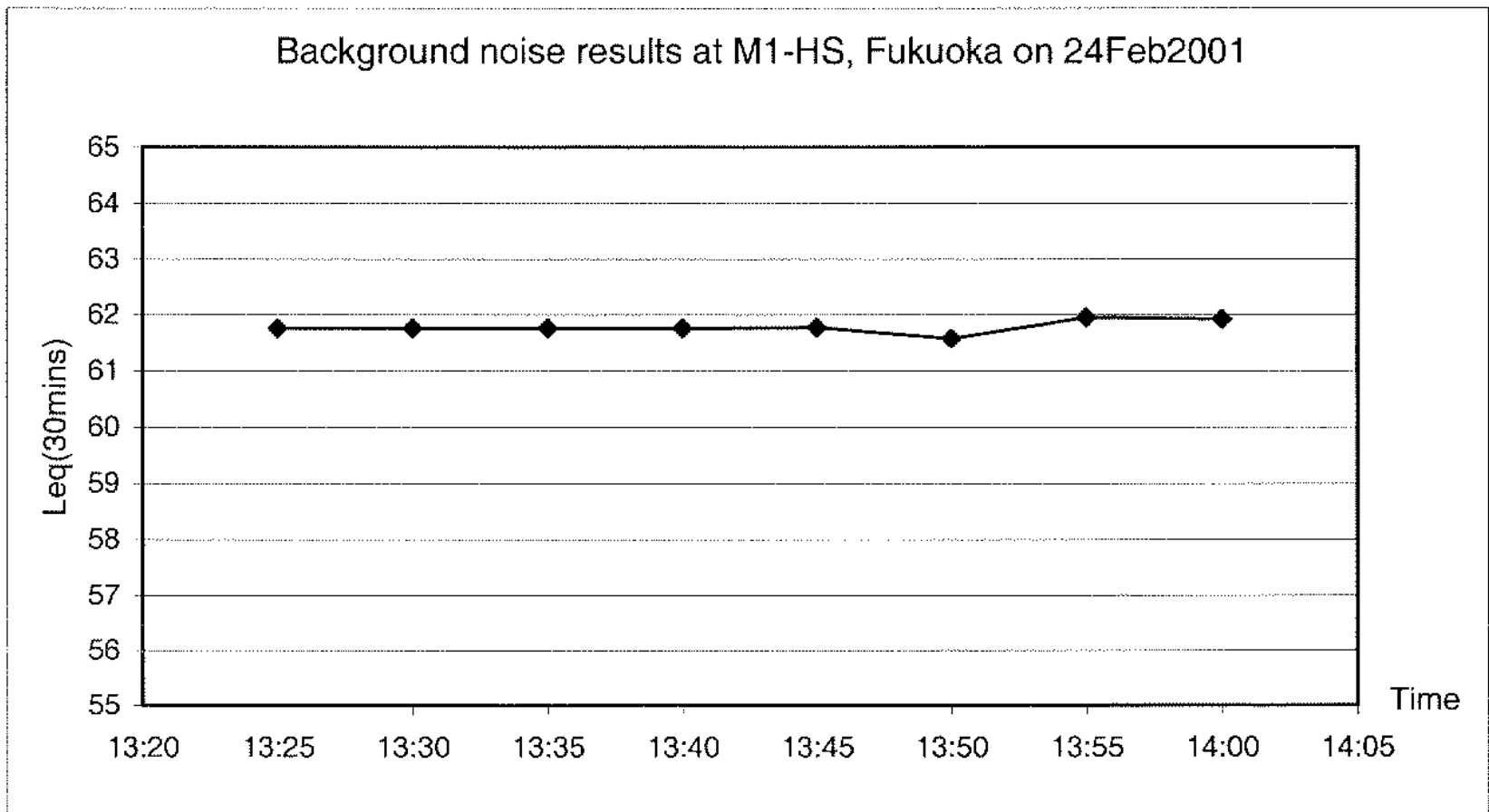
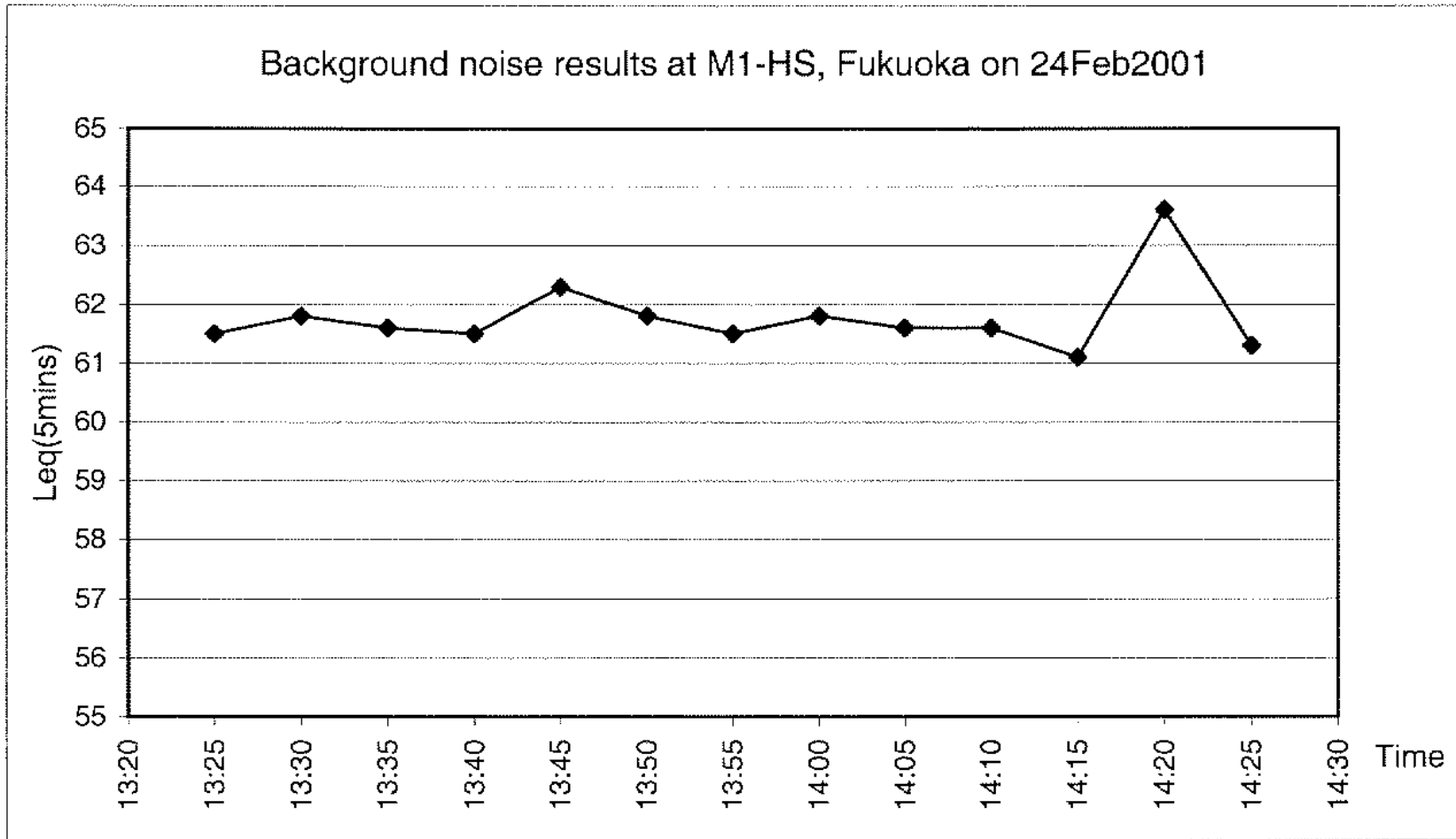


SEKDFS
STADIUM NOISE MONITORING
FEB 2001
Location M1-HS
24 February 2001 pm

Monitoring Location	M1-HS, 29/F Sea Hawk Hotel, Fukuoka
Date of Monitoring	24-Feb-01
Weather Condition	Cloudy
Measurement Start Time (hh:mm)	13:25
Measurement Time Length (min.)	60min
Measurement Duration	5mins interval
Noise Meter Model/Identification	Rion NA-27 (mode of record: 1/3 octave band frequency analysis)
Calibrator Model/Identification	Rion NC-73
Measurement Results	See attached.
Leq (dB(A))	
Lmax (dB(A))	
Lmin (db(A))	
Major Noise Source(s) During Monitoring	Traffic noise from road south to the dome
Other Noise Source(s) During Monitoring	PA system from outside the dome
Remarks	

SEKDFS
 STADIUM NOISE MONITORING
 FEB 2001
 Location M1-HS
 24 February 2001 pm

Record No.	Measuring Time From (hh:mm)	To (hh:mm)	Time	Wind speed	Wind direction	Leq (5mins)	Leq (30mins)	Lmax	Lmin	L10	L90	Event
1	13:25	13:30	13:25	1m/s	NW	61.5	61.8	68.7	58.8	62.9	60.2	car engine noise
2	13:30	13:35				61.8	61.8	67.8	59.3	63.2	60.5	car engine noise
3	13:35	13:40	13:35	1m/s	NW	61.6	61.8	68.7	58.3	63.0	59.9	car engine noise
4	13:40	13:45				61.5	61.8	68.0	59.1	62.7	60.4	car engine noise
5	13:45	13:50				62.3	61.8	84.2	58.4	63.1	60.1	car engine noise, very noisy; car braking; car horn
6	13:50	13:55	13:50	<1m/s	NW	61.8	61.6	70.0	59.3	63.1	60.4	car engine noise
7	13:55	14:00				61.5	61.9	70.2	58.3	62.8	59.9	car engine noise
8	14:00	14:05				61.8	61.9	75.9	58.5	62.8	60.1	car engine noise
9	14:05	14:10	14:05	<1m/s	NW	61.6		77.8	58.6	62.8	59.9	car engine noise
10	14:10	14:15				61.6		72.7	58.2	62.9	60.0	car braking
11	14:15	14:20				61.1		73.1	58.7	62.3	60.1	car engine noise
12	14:20	14:25	14:20	<1m/s	NW	63.6		81.5	58.6	64.7	60.0	car engine noise, very noisy
13	14:25	14:30				61.3		66.7	58.9	62.5	60.2	car engine noise
14												
15												
16												
17												
average						61.8	61.8					



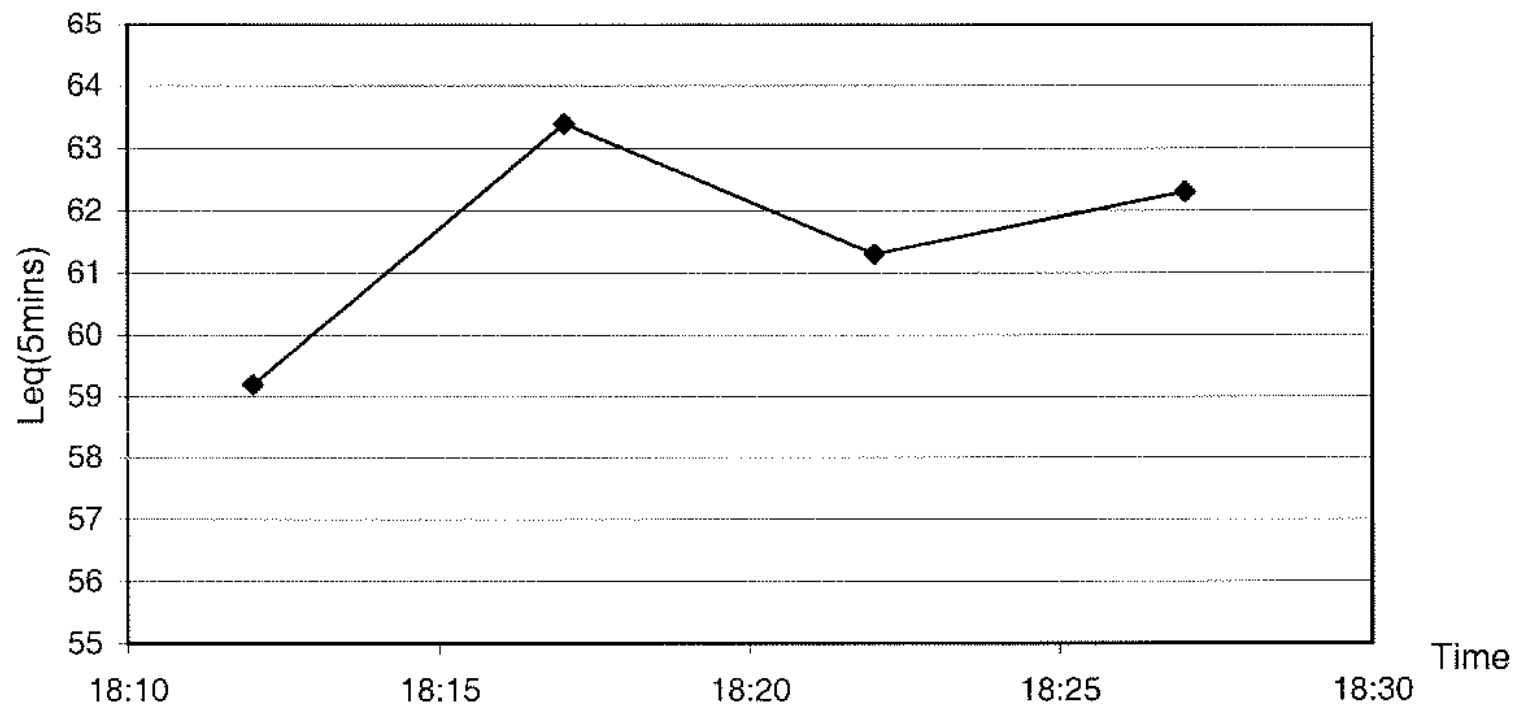
SEKDFS
STADIUM NOISE MONITORING
FEB 2001
Location M1-L
23 February 2001

Monitoring Location	M1-L, 7/F Sea Hawk Hotel, Fukuoka
Date of Monitoring	23-Feb-01
Weather Condition	Cloudy, windy and rainy
Measurement Start Time (hh:mm)	18:12
Measurement Time Length (min.)	20mins
Measurement Duration	5mins interval
Noise Meter Model/Identification	Rion NA-27 (mode of record: 1/3 octave band frequency analysis)
Calibrator Model/Identification	Rion NC-73
Measurement Results	See attached.
Leq (dB(A))	
Lmax (dB(A))	
Lmin (db(A))	
Major Noise Source(s) During Monitoring	Plant noise from ventilation shaft; Traffic noise from highway north to the dome
Other Noise Source(s) During Monitoring	
Remarks	

SEKDFS
 STADIUM NOISE MONITORING
 FEB 2001
 Location M1-L
 23 February 2001

Record No.	Measuring Time		Leq (5mins)	Lmax	Lmin	L10	L90	Event
	From (hh:mm)	To (hh:mm)						
1	18:12	18:12	59.2	73.5	53.6	60.6	56.7	
2	18:17	18:17	63.4	74.8	57	66.5	59.4	
3	18:22	18:22	61.3	74.2	57	63.4	58.5	
4	18:27	18:27	62.3	74.1	57.8	64.4	59.4	
5								
6								
7								
8								
9								
10								
average			61.8					

Background noise results at 7/F Sea Hawk Hotel, Fukuoka on
23Feb2001



SEKDFS
STADIUM NOISE MONITORING
FEB 2001
Location M1-HE
24 February 2001 Concert Period

Monitoring Location	M1-HE, 29/F Sea Hawk Hotel, Fukuoka
Date of Monitoring	24-Feb-01
Weather Condition	Cloudy, occasional rain
Measurement Start Time (hh:mm)	18:02
Measurement Time Length (min.)	5mins interval
Measurement Duration	4hrs15mins
Noise Meter Model/Identification	Rion NL-14
Calibrator Model/Identification	Rion NC-73
Measurement Results	
Leq (dB(A))	
Lmax (dB(A))	
Lmin (db(A))	
Major Noise Source(s) During Monitoring	Traffic noise from road south to the dome
Other Noise Source(s) During Monitoring	
Remarks	at the façade facing the dome, but data is greatly affected by strong wind

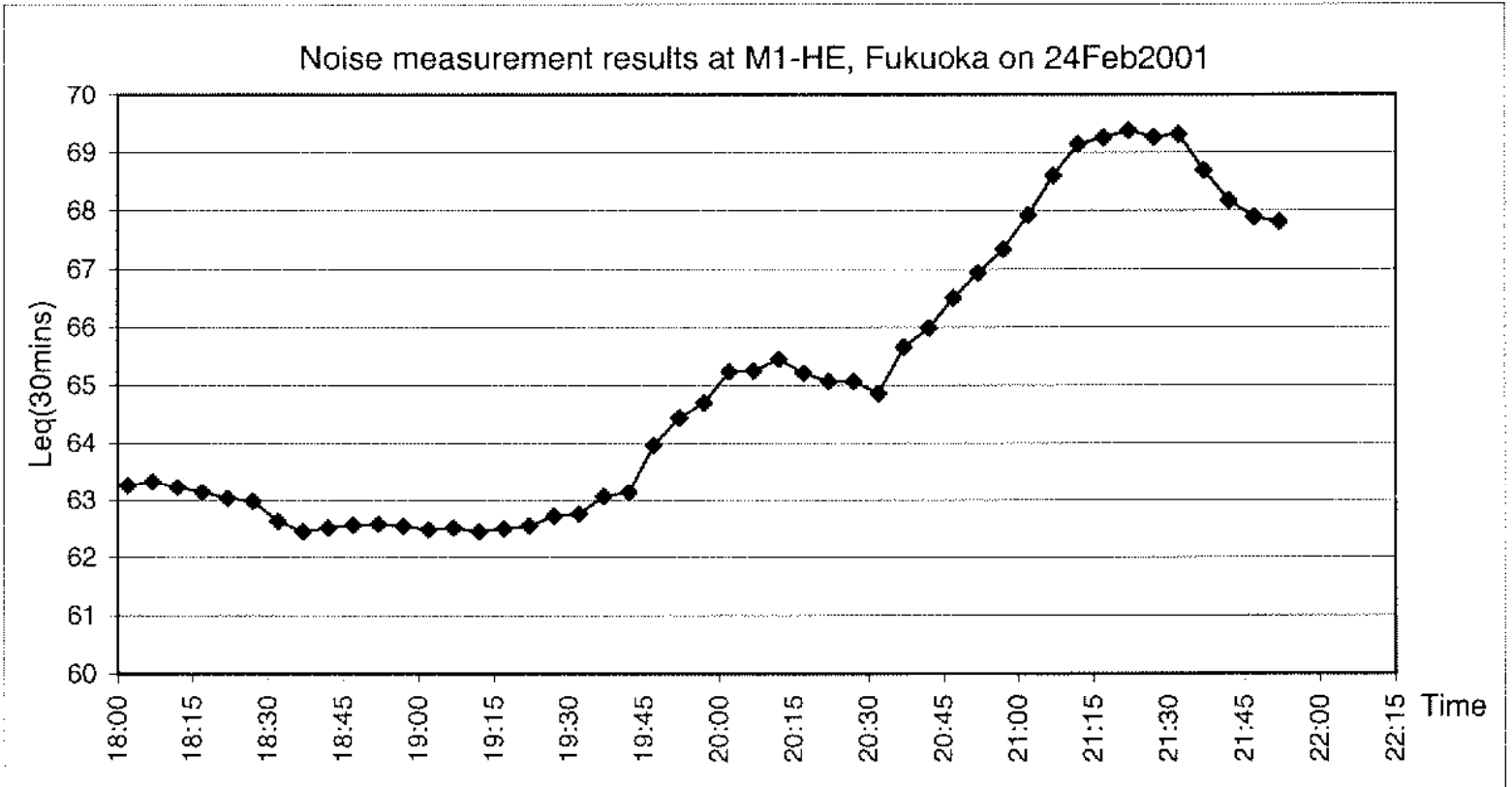
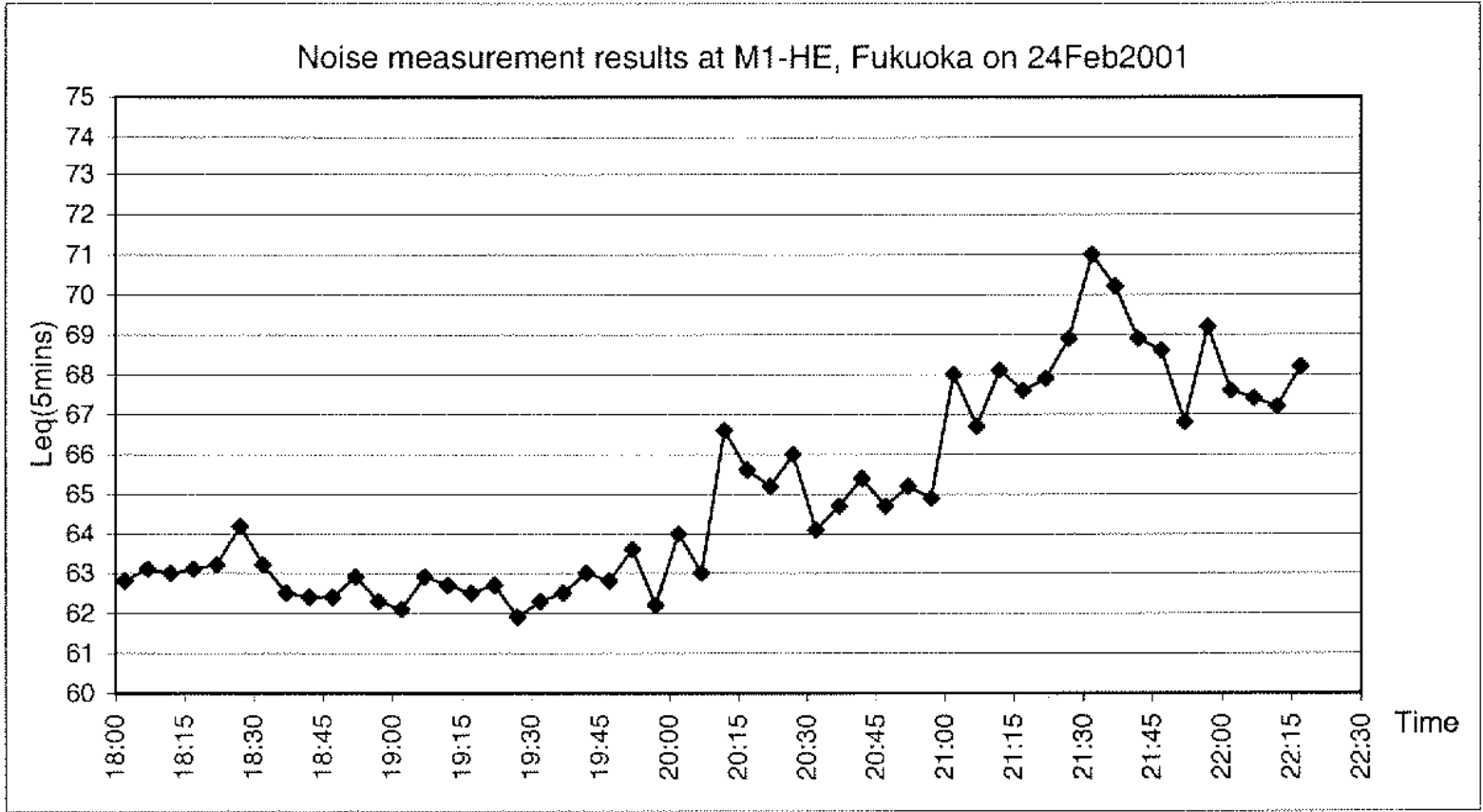
SEKDFS
 STADIUM NOISE MONITORING
 FEB 2001
 Location M1-HE
 24 February 2001 Concert Period

Record No.	Measuring Time		Time	Wind speed	Wind direction (outside)	Leq (5mins)	Leq (30mins)	Lmax
	From (hh:mm)	To (hh:mm)						
			1704	7m/s	NW			
			1721	6m/s	NW			
			1736	6.5m/s	NW			
			1751	6m/s	NW			
1	18:02	18:07				62.8	63.3	73.7
2	18:07	18:12	1806	6m/s	NW	63.1	63.3	67.7
3	18:12	18:17				63.0	63.2	71.6
4	18:17	18:22				63.1	63.1	70.3
5	18:22	18:27	1821	5m/s	NW	63.2	63.0	73.0
6	18:27	18:32				64.2	63.0	72.0
7	18:32	18:37				63.2	62.6	72.0
8	18:37	18:42	1836	3m/s	NW	62.5	62.4	70.2
9	18:42	18:47				62.4	62.5	69.9
10	18:47	18:52				62.4	62.6	71.7
11	18:52	18:57	1851	6m/s	NW	62.9	62.6	79.3
12	18:57	19:02				62.3	62.5	74.5
13	19:02	19:07				62.1	62.5	68.8
14	19:07	19:12	1906	7m/s	NW	62.9	62.5	73.1
15	19:12	19:17				62.7	62.4	67.6
16	19:17	19:22				62.5	62.5	68.2
17	19:22	19:27	1921	7m/s	NW	62.7	62.5	69.7
18	19:27	19:32				61.9	62.7	66.4
19	19:32	19:37				62.3	62.8	73.6
20	19:37	19:42				62.5	63.1	71
21	19:42	19:47				63.0	63.1	68
22	19:47	19:52				62.8	64.0	72.6
23	19:52	19:57				63.6	64.4	77.8
24	19:57	20:02				62.2	64.7	69
25	20:02	20:07				64.0	65.2	74.4
26	20:07	20:12				63.0	65.2	69.7
27	20:12	20:17				66.6	65.4	72.8
28	20:17	20:22				65.6	65.2	73.7
29	20:22	20:27				65.2	65.1	71.7
30	20:27	20:32				66.0	65.1	77
31	20:32	20:37				64.1	64.9	70.3
32	20:37	20:42				64.7	65.7	71.3
33	20:42	20:47				65.4	66.0	75.3
34	20:47	20:52				64.7	66.5	71.2
35	20:52	20:57				65.2	66.9	71.8
36	20:57	21:02				64.9	67.3	73.6
37	21:02	21:07				68.0	67.9	74.5
38	21:07	21:12				66.7	68.6	71.6
39	21:12	21:17				68.1	69.1	86.9
40	21:17	21:22				67.6	69.3	78.6
41	21:22	21:27				67.9	69.4	75.3
42	21:27	21:32				68.9	69.3	76.4
43	21:32	21:37				71.0	69.3	78.1
44	21:37	21:42				70.2	68.7	77.3
45	21:42	21:47				68.9	68.2	76.5
46	21:47	21:52				68.6	67.9	77.2
47	21:52	21:57				66.8	67.8	73.5
48	21:57	22:02				69.2		76.4
49	22:02	22:07				67.6		74.7
50	22:07	22:12				67.4		74.2
51	22:12	22:17				67.2		74.7
52	22:17	22:22				68.2		75.3
					average	65.7	65.7	

Remarks

rain
 heavy rain

Event: same as for noise data at 29(1)_24Feb01.xls



SEKDFS
STADIUM NOISE MONITORING
FEB 2001
Location M1-HS
24 February 2001 Concert Period

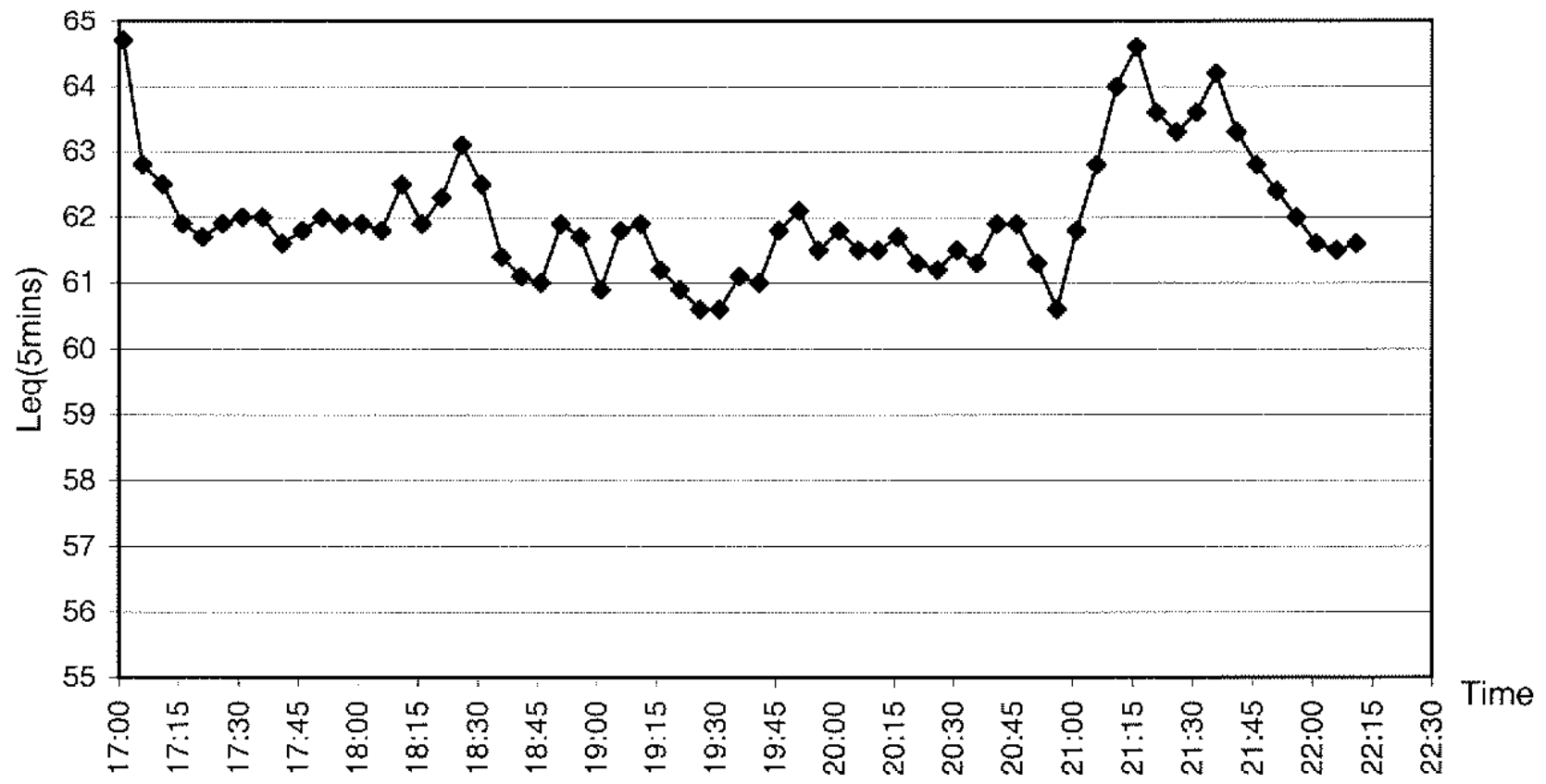
Monitoring Location	M1-HS, 29/F Sea Hawk Hotel, Fukuoka
Date of Monitoring	24-Feb-01
Weather Condition	Cloudy, occasional rain
Measurement Start Time (hh:mm)	17:01
Measurement Time Length (min.)	5mins interval
Measurement Duration	5hrs15mins
Noise Meter Model/Identification	Rion NA-27 (mode of record: 1/3 octave band frequency analysis)
Calibrator Model/Identification	Rion NC-73
Measurement Results	
Leq (dB(A))	
Lmax (dB(A))	
Lmin (db(A))	
Major Noise Source(s) During Monitoring	Traffic noise from road south to the dome
Other Noise Source(s) During Monitoring	PA system outside the dome; intermittent noise of car & ambulance horn, whistling sound; car engine noise and braking sound
Remarks	

SEKDFS
 STADIUM NOISE MONITORING
 FEB 2001
 Location M1-HS
 24 February 2001 Concert Period

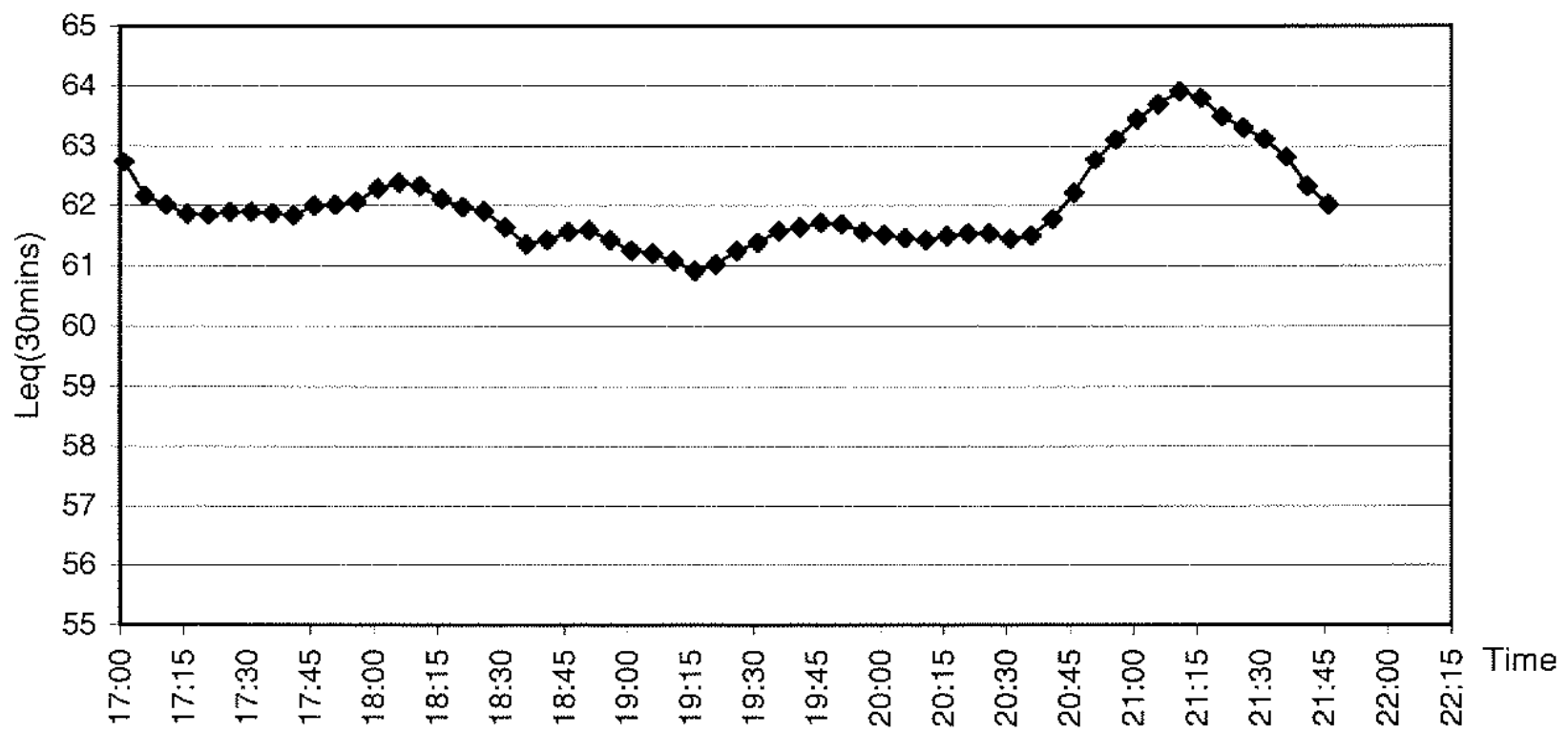
Record No.	Measuring Time		Time	Wind speed	Wind speed (outside)	Wind direction	Leq (5mins)	Leq (30mins)	Lmax	Lmin	L10	L90	Event	
	From (hh:mm)	To (hh:mm)												
1	17:01	17:06	1704	<1m/s	7m/s	NW	64.7	62.7	79.6	59.2	67.7	60.6	ambulance horn	
2	17:06	17:11					62.8	62.2	82.2	59.8	63.8	61.1	PA system outside the dome	
3	17:11	17:16					62.5	62.0	71.5	59.3	63.9	60.8	car horn, car engine noise	
4	17:16	17:21					61.9	61.9	72.4	59.5	63.0	60.8	PA system outside the dome; car horn	
5	17:21	17:26	1721	<1m/s	6m/s	NW	61.7	61.8	70.5	59.5	62.8	60.8	car horn, car engine noise	
6	17:26	17:31					61.9	61.9	72.9	59.3	63.5	60.5		
7	17:31	17:36					62.0	61.9	69.9	59.2	63.4	60.7	PA system outside the dome	
8	17:36	17:41	1736	<1m/s	6.5m/s	NW	62.0	61.9	72.8	59.1	63.5	60.5	motorcycle engine noise, car braking	
9	17:41	17:46					61.6	61.8	70.7	59.1	62.9	60.4	car horn	
10	17:46	17:51					61.8	62.0	67.8	59.2	62.9	60.6	car horn	
11	17:51	17:56	1751	<1m/s	6m/s	NW	62.0	62.0	68.9	59.5	63.1	60.7		
12	17:56	18:01					61.9	62.1	75.6	59.2	62.8	60.6	car engine noise; car braking; ambulance horn	
13	18:01	18:06					61.9	62.3	69.6	59.7	63.3	60.7	PA system outside the dome, car horn	
14	18:06	18:11	1806	<1m/s	6m/s	NW	61.8	62.4	69.7	59.4	62.7	60.7		
15	18:11	18:16					62.5	62.3	78.3	59.8	63.2	61.1	car horn	
16	18:16	18:21					61.9	62.1	72.8	59.6	62.8	60.8	car horn	
17	18:21	18:26	1821	<1m/s	5m/s	NW	62.3	62.0	70.4	59.6	63.7	60.9	car engine noise	
18	18:26	18:31					63.1	61.9	70.4	59.5	65.0	61.3		
19	18:31	18:36					62.5	61.6	70.0	59.3	64.2	61.0	car horn	
20	18:36	18:41	1836	<1m/s	3m/s	NW	61.4	61.3	68.7	58.5	62.9	59.9	car horn	
21	18:41	18:46					61.1	61.4	67.4	57.9	62.3	59.8	car braking	
22	18:46	18:51					61.0	61.6	71.1	58.3	62.0	59.9	car braking	
23	18:51	18:56	1851	<1m/s	6m/s	NW	61.9	61.6	75.8	58.4	63.2	60.1	PA system outside the dome	
24	18:56	19:01					61.7	61.4	76.8	59.2	62.6	60.4		
25	19:01	19:06					60.9	61.2	68.6	58.7	62.0	60.1		
26	19:06	19:11	1906	<1m/s	7m/s	NW	61.8	61.2	75.8	58.1	62.6	60.3	car engine noise	
27	19:11	19:16					61.9	61.1	70.8	58.9	63.2	60.4		
28	19:16	19:21					61.2	60.9	72.8	58.2	62.1	60.0		
29	19:21	19:26	1921	<1m/s	7m/s	NW	60.9	61.0	69.4	58.0	62.2	59.7		
30	19:26	19:31					60.6	61.2	68.7	58.3	61.8	59.6	car engine noise; car horn	
31	19:31	19:36					60.6	61.4	70.9	58.5	61.5	59.7	car horn; car braking noise	
32	19:36	19:41					61.1	61.6	73.3	58.6	62.0	60.1	car horn	
33	19:41	19:46					61.0	61.6	68.0	58.2	62.2	59.7		
34	19:46	19:51					61.8	61.7	76.5	58.1	62.2	60.0		
35	19:51	19:56					62.1	61.7	71.9	59.2	63.2	60.6		
36	19:56	20:01					61.5	61.6	70.8	58.4	62.7	60.0		
37	20:01	20:06					61.8	61.5	72.0	58.3	62.9	60.4		
38	20:06	20:11					61.5	61.5	71.2	59.1	62.6	60.3	car engine noise	
39	20:11	20:16					61.5	61.4	66.5	59.0	62.5	60.4		
40	20:16	20:21					61.7	61.5	66.4	58.8	62.9	60.5	car engine noise; car braking	
41	20:21	20:26					61.3	61.5	65.5	58.2	62.5	60.0		
42	20:26	20:31					61.2	61.5	73.4	58.3	62.3	59.9		
43	20:31	20:36					61.5	61.4	65.0	59.1	62.8	60.4		
44	20:36	20:41					61.3	61.5	67.0	58.4	62.6	60.0		
45	20:41	20:46					61.9	61.8	75.4	58.9	62.6	60.1		
46	20:46	20:51					61.9	62.2	75.9	58.5	63.1	60.1		
47	20:51	20:56					61.3	62.8	72.9	58.2	62.5	59.7		
48	20:56	21:01					60.6	63.1	65.7	57.8	61.9	59.3		
49	21:01	21:06					61.8	63.4	69.8	59.3	63.0	60.6		
50	21:06	21:11					62.8	63.7	71.4	58.3	64.3	60.8	car horn; concert dismiss; whistling sound	
51	21:11	21:16					64.0	63.9	72.3	59.7	65.7	62.1	car engine noise; whistling sound	
52	21:16	21:21					64.6	63.8	86.8	60.8	64.9	62.1	whistling sound	
53	21:21	21:26					63.6	63.5	71.2	61.5	64.6	62.7	car engine noise; whistling sound	
54	21:26	21:31					63.3	63.3	70.6	61.1	64.4	62.4	whistling sound	
55	21:31	21:36					63.6	63.1	69.2	61.0	64.9	62.3	car engine noise; PA system outside the dome	
56	21:36	21:41					64.2	62.8	76.7	61.1	65.1	62.6	car horn	
57	21:41	21:46					63.3	62.3	73.2	60.0	64.8	61.8	PA system outside the dome	
58	21:46	21:51					62.8	62.0	72.8	60.3	64.2	61.4	car engine noise; car horn; PA system outside the dome	
59	21:51	21:56					62.4	62.4	71.9	59.7	63.7	60.9	car engine noise; whistling sound	
60	21:56	22:01					62.0	62.0	74.2	59.2	63.2	60.6	car horn	
61	22:01	22:06					61.6	61.6	69.4	58.8	63.1	60.1	whistling sound	
62	22:06	22:11					61.5	61.5	77.6	58.0	62.9	59.8	car horn; whistling sound, plane flying above	
63	22:11	22:16					61.6	61.6	79.3	58.4	62.5	59.8		
average							62.1	62.1						

heavy rain
 slight rain

Noise measurement results at M1-HS, Fukuoka on 24Feb2001



Noise measurement results at M1-HS, Fukuoka on 24Feb2001



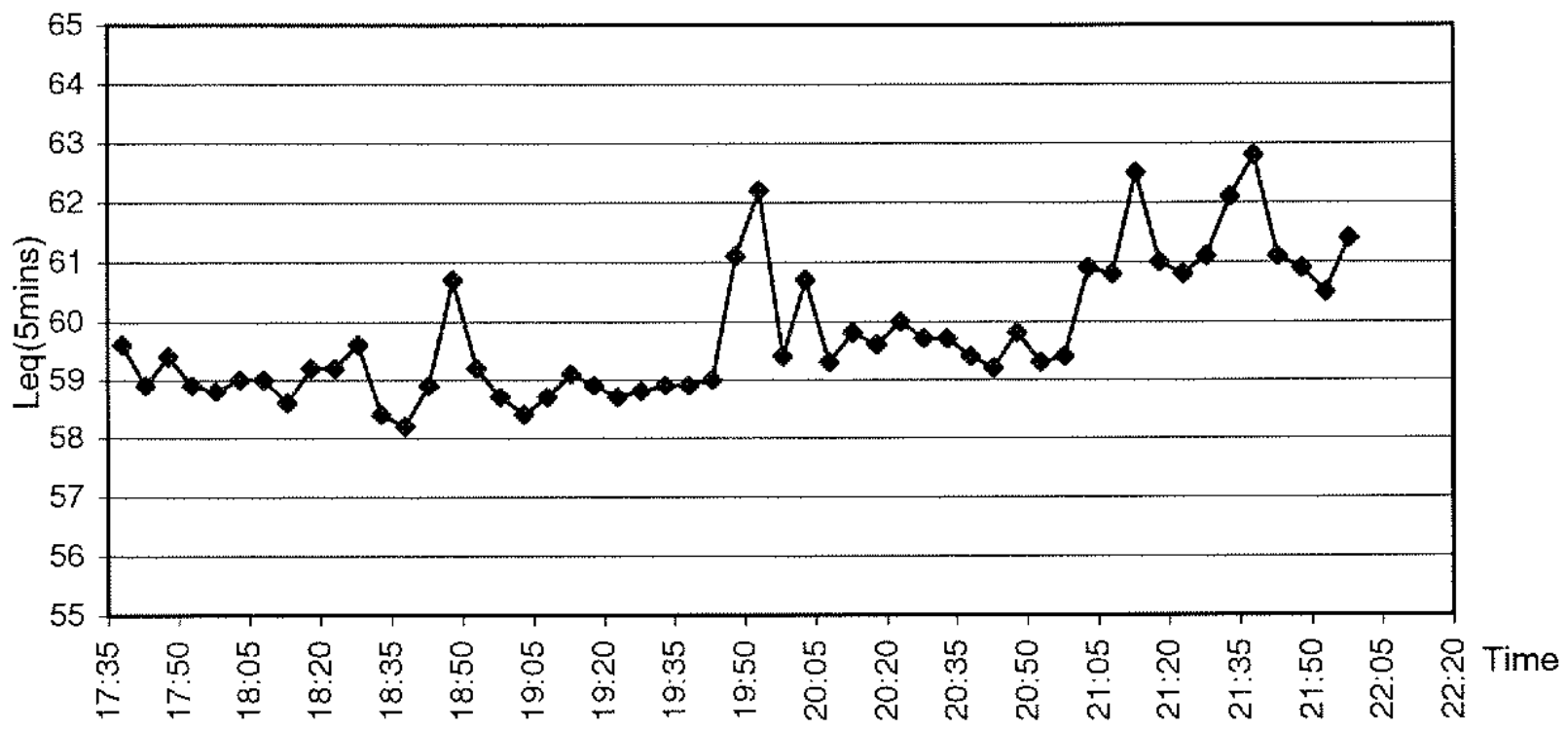
SEKDFS
STADIUM NOISE MONITORING
FEB 2001
Location M1-L
24 February 2001

Monitoring Location	M1-L, 7/F Sea Hawk Hotel, Fukuoka
Date of Monitoring	24-Feb-01
Weather Condition	Cloudy, occasional rain
Measurement Start Time (hh:mm)	17:38
Measurement Time Length (min.)	5mins interval
Measurement Duration	4hrs20mins
Noise Meter Model/Identification	Rion NA-27 (mode of record: 1/3 octave band frequency analysis)
Calibrator Model/Identification	Rion NC-73
Measurement Results	
Leq (dB(A))	
Lmax (dB(A))	
Lmin (db(A))	
Major Noise Source(s) During Monitoring	Traffic noise from road south to the dome
Other Noise Source(s) During Monitoring	
Remarks	

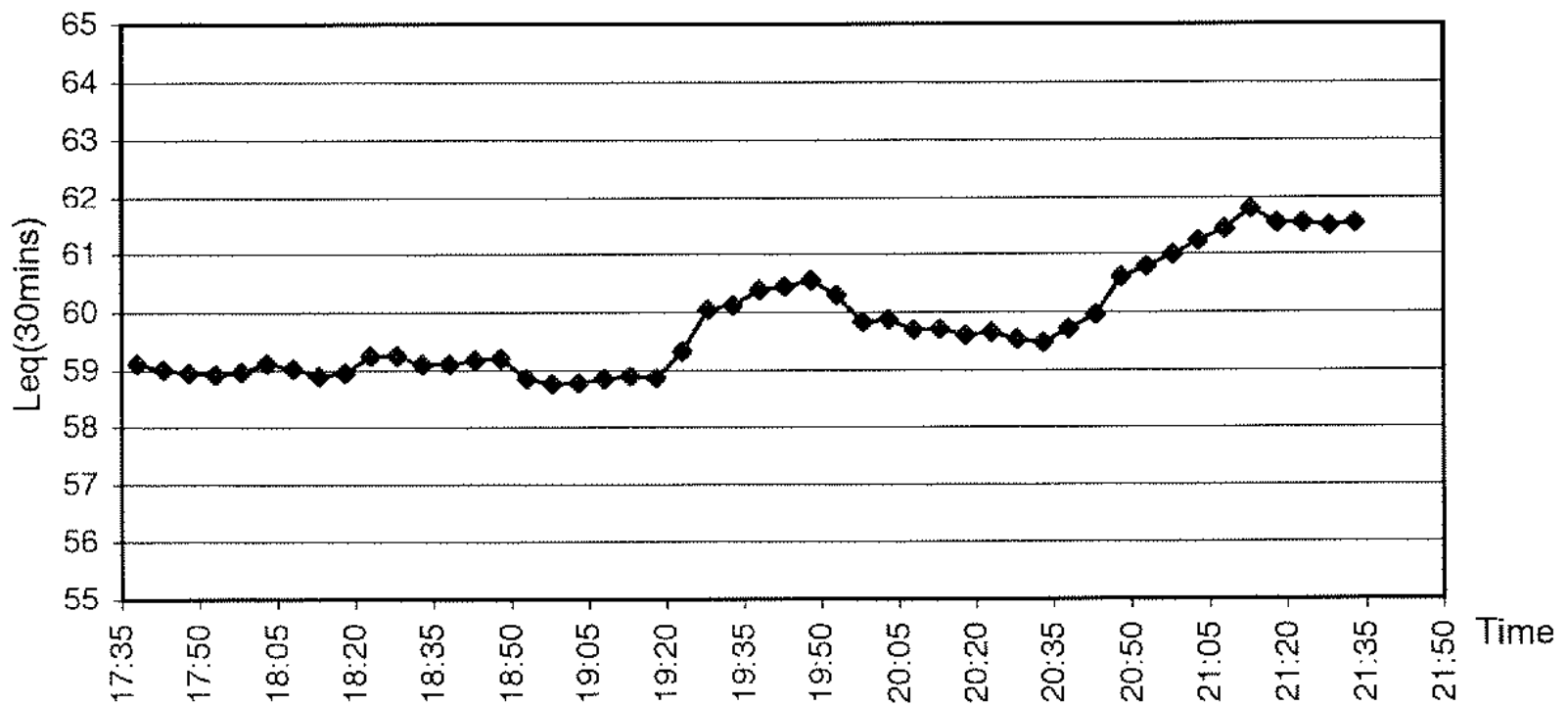
SEKDFS												
STADIUM NOISE MONITORING												
FEB 2001												
Location M1-L												
24 February 2001												
Record No.	Measuring Time		Time	Wind speed	Wind direction	Leq (5mins)	Leq (30mins)	Lmax	Lmin	L10	L90	Event
	From (hh:mm)	To (hh:mm)										
1	17:38	17:43				59.6	59.1	74.9	56.6	60.8	58.0	
2	17:43	17:48				58.9	59.0	64.1	57.1	59.8	58.0	
3	17:48	17:53				59.4	59.0	68.7	57.5	60.1	58.5	
4	17:53	17:58				58.9	58.9	63.0	57.2	59.7	58.2	
5	17:58	18:03				58.8	59.0	65.4	57.0	59.8	58.0	
6	18:03	18:08				59.0	59.1	63.1	57.2	59.7	58.4	
7	18:08	18:13				59.0	59.0	62.2	57.3	59.8	58.3	
8	18:13	18:18				58.6	58.9	64.0	57.3	59.4	58.1	
9	18:18	18:23				59.2	58.9	66.5	57.5	60.0	58.5	
10	18:23	18:28				59.2	59.2	66.3	57.4	60.1	58.5	
11	18:28	18:33				59.6	59.2	67.8	57.2	60.9	58.3	
12	18:33	18:38				58.4	59.1	63.9	56.7	59.2	57.8	
13	18:38	18:43				58.2	59.1	62.1	56.7	58.9	57.6	
14	18:43	18:48				58.9	59.2	67.6	57.3	59.7	58.2	
15	18:48	18:53				60.7	59.2	68.5	57.2	63.3	58.4	
16	18:53	18:58				59.2	58.8	66.0	57.3	60.3	58.3	
17	18:58	19:03				58.7	58.8	70.2	55.9	59.4	57.8	
18	19:03	19:08				58.4	58.8	63.5	56.8	59.2	57.8	
19	19:08	19:13				58.7	58.9	66.7	57.0	59.6	57.9	
20	19:13	19:18				59.1	58.9	63.2	57.5	59.9	58.4	
21	19:18	19:23				58.9	58.9	71.7	57.2	59.6	58.2	
22	19:23	19:28				58.7	59.3	71.5	56.2	59.4	57.6	
23	19:28	19:33				58.8	60.0	69.9	57.1	59.7	58.0	
24	19:33	19:38	1935	3.5m/s		58.9	60.1	64.4	56.9	59.7	58.2	
25	19:38	19:43				58.9	60.4	64.3	56.7	59.7	58.1	
26	19:43	19:48				59.0	60.4	64.8	57.3	59.8	58.2	
27	19:48	19:53				61.1	60.5	73.0	57.7	63.2	58.9	
28	19:53	19:58				62.2	60.3	73.7	57.6	64.6	58.6	
29	19:58	20:03				59.4	59.8	67.3	57.0	60.8	57.9	
30	20:03	20:08				60.7	59.9	75.7	56.9	62.2	58.8	
31	20:08	20:13				59.3	59.7	62.5	57.6	60.4	58.5	
32	20:13	20:18				59.8	59.7	63.4	57.0	60.7	58.8	
33	20:18	20:23				59.6	59.6	69.1	57.1	60.7	58.4	
34	20:23	20:28				60.0	59.6	77.0	57.6	60.9	58.7	
35	20:28	20:33	2027	3.5m/s		59.7	59.5	66.5	57.3	60.9	58.6	
36	20:33	20:38				59.7	59.5	64.6	57.7	60.8	58.9	

37	20:38	20:43		59.4	59.7	65.1	57.3	60.3	58.6	
38	20:43	20:48		59.2	60.0	62.7	56.9	60.2	58.4	
39	20:48	20:53		59.8	60.6	65.3	57.9	60.8	58.8	
40	20:53	20:58		59.3	60.8	66.4	56.5	60.3	58.1	
41	20:58	21:03		59.4	61.0	77.0	56.9	60.3	58.3	
42	21:03	21:08		60.9	61.2	65.6	58.2	62.1	59.6	
43	21:08	21:13		60.8	61.4	64.6	58.2	61.9	59.7	concert dismiss
44	21:13	21:18		62.5	61.8	74.8	58.6	63.9	60.0	concert dismiss
45	21:18	21:23		61.0	61.5	64.7	58.4	62.3	59.8	concert dismiss
46	21:23	21:28		60.8	61.5	65.9	58.3	62.2	59.5	concert dismiss
47	21:28	21:33		61.1	61.5	70.3	58.3	62.2	59.8	
48	21:33	21:38		62.1	61.5	70.0	59.5	63.3	60.8	
49	21:38	21:43		62.8		72.7	59.1	64.3	60.5	
50	21:43	21:48		61.1		69.9	57.6	62.4	59.9	
51	21:48	21:53		60.9		65.4	58.5	62.0	60.0	
52	21:53	21:58		60.5		67.0	58.0	61.6	59.5	
53	21:58	22:03		61.4		74.4	58.2	62.6	59.5	
			average	59.9	59.9					
Remarks										
	rain									
	heavy rain									

Noise measurement results at 7/F Sea Hawk Hotel, Fukuoka on 24Feb2001



Noise measurement results at 7/F Sea Hawk Hotel, Fukuoka on 24Feb2001



SEKDFS					
STADIUM NOISE MONITORING					
FEB 2001					
Traffic count					
Location: Fukuoka City Highway to the north of Fukuoka Dome					
Measurement time length: 5mins					
Date	Time	Direction	No. of light veh	No. of heavy veh	Remarks
24-Feb-01	10:45-10:50	WB	87	6	
	10:45-10:50	EB	81	13	
	11:30-11:35	WB	92	2	
	11:30-11:35	EB	87	10	
	13:28-13:33	WB	88	3	
	13:28-13:33	EB	72	18	
	18:55-19:00	EB	70	1	slow queing
	18:28-18:33	WB	77	9	
	20:37-20:42	EB	56	1	
	20:21-20:26	WB	52	2	slow queing
WB			light veh	heavy veh	
average no. in 5mins			78.6	2.6	
no. of veh/hr			943	31	
%			96.8%	3.2%	
EB			light veh	heavy veh	
average no. in 5mins			73.8	10.4	
no. of veh/hr			886	125	
%			87.6%	12.4%	

SEKDFS					
STADIUM NOISE MONITORING					
FEB 2001					
Traffic count					
Location: local road to the south of Fukuoka Dome					
Measurement time length: 5mins					
Date	Time	Direction	No. of light veh	No. of heavy veh	Remarks
24-Feb-01	10:53-10:58	WB	40	3	
	10:53-10:58	EB	46	6	
	11:36-11:41	WB	41	2	
	11:36-11:41	EB	42	6	
	13:36-13:41	WB	64	6	
	13:36-13:41	EB	47	5	slow queing
	19:00-19:05	WB	35	2	
	19:12-19:17	EB	42	8	slow queing
	21:01-21:06	WB	58	2	slow queing
	21:11-21:16	EB	42	4	slow queing
		WB	light veh	heavy veh	
		average no. in 5mins	47.6	3	
		no. of veh/hr	571	36	
		%	94.1%	5.9%	
		EB	light veh	heavy veh	
		average no. in 5mins	43.8	5.8	
		no. of veh/hr	526	70	
		%	88.3%	11.7%	

APPENDIX B

NOISE MEASUREMENT RESULTS INSIDE THE DOME FROM TAKENAKA

March 6, 2001

Noise measurement Result
Judy & Mary Concert in Fukuoka Dome

1. Date of measurement
19:09 from 19:04 February 24, 2001
2. Measurement item
A- weighted sound pressure level(spontaneous level and Leq)
3. Measurement point
Field between home base and fence.
4. Measurers
Daisaku Sho. Research & Development Institute, Takenaka Corporation
5. Measurement method
A- weighted sound pressure levels were measured using Noise Level Meter(Rion NL-02A).
6. Result of Measurement
A-weighted sound pressure levels measured are shown in Table 1

Table 1 A-weighted sound pressure levels measured(dBA)

Time \ Item	spontaneous level	Leq
19:04~19:09	96~105	100.5

Daisaku Sho
Research & Development Institute, Takenaka Corporation

APPENDIX C

**SOUND TRANSMISSION LOSS INFORMATION FOR RETRACTABLE ROOF SUPPLIED BY
MITSUBISHI**

Table1 Sound transmission loss of each part of Fukuoka dome roof

Frequency(Hz)	63	125	250	500	1000	2000	4000	remarks column
Roof	23.5	28.0	35.0	40.0	45.0	44.5	49.5	Laboratory data
Partition panel	16.0	22.0	28.0	34.0	40.0	40.0	45.5	Laboratory data
Eaves ceiling	18.0	23.5	29.5	37.0	45.0	47.5	56.0	Estimated value
Gable sidewall	18.0	23.5	30.0	37.5	46.0	48.5	57.0	Estimated value
Active seal	9.0	15.0	23.5	33.5	45.0	55.5	66.5	Estimated value
Passive seal	6.5	10.5	15.0	20.0	25.0	30.5	36.0	Estimated value

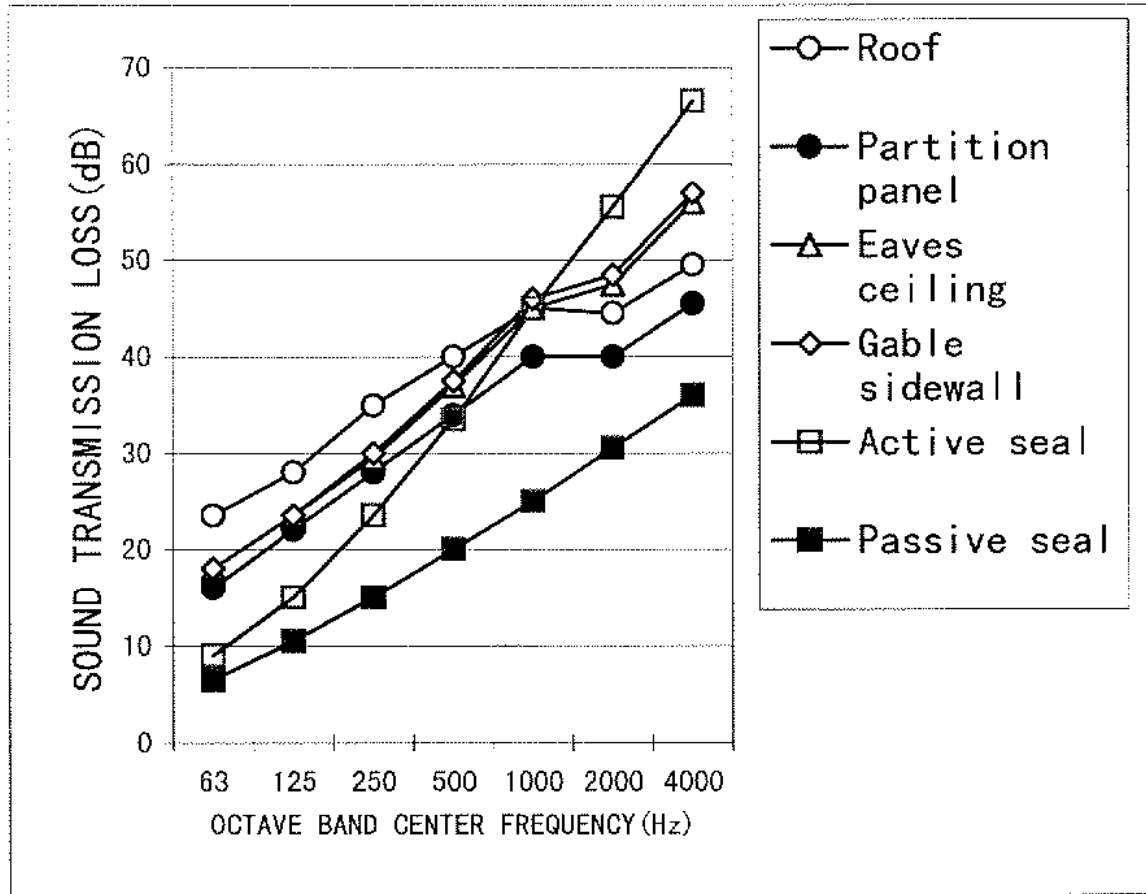
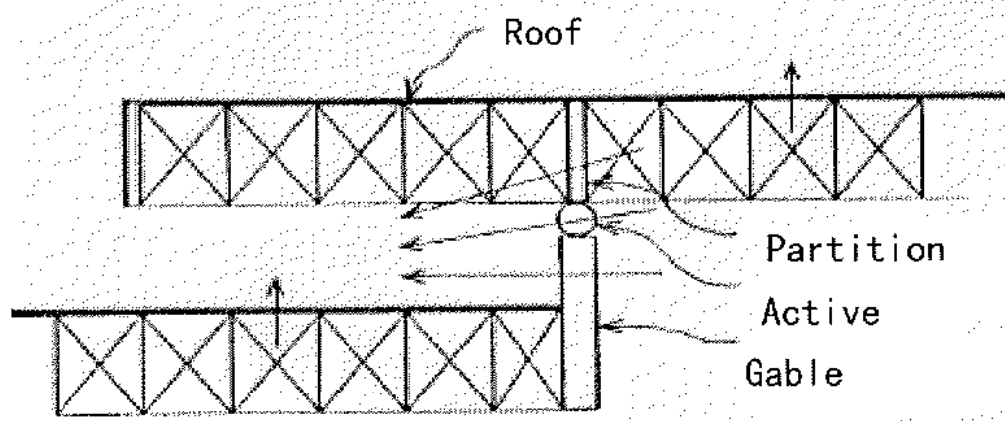


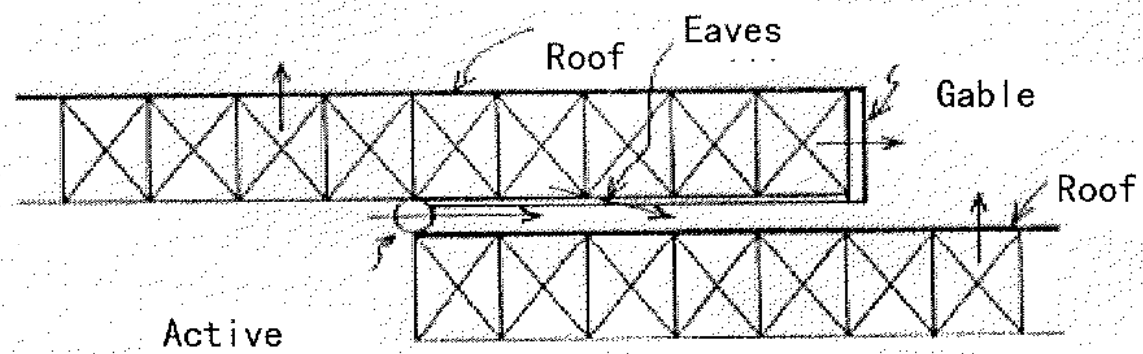
Fig.1 Sound transmission loss of each part of Fukuoka dome roof

Table1 Section specification of each part of Fukuoka dome roof

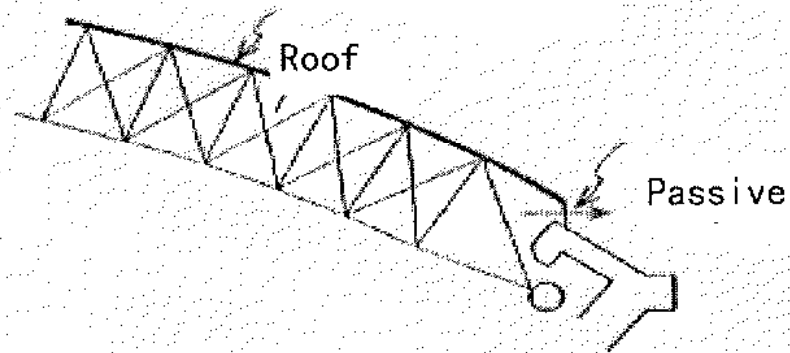
Each part	Section specification
Roof	Titanium 0.3mm+excelsior-board25mm(25kg/m ²) +air space100mm +fiber glass50mm(48kg/m ³)
Partition panel	Excelsior-board25mm(25kg/m ²)
Eaves ceiling	Stainless steel0.8mm+air space15mm+excelsior board25mm(25kg/m ²)
Gable sidewall	Stainless steel0.8mm+air space25mm+excelsior board25mm(25kg/m ²)
Active seal	Upper part;Chloroprene rubber3mm+air space300+chloroprene rubber3mm Lower part;Chloroprene rubber5mm+air space400+chloroprene rubber5mm
Passive seal	Chloroprene rubber5mm



a) Junction of upper roof and lower roof



b) Junction of middle roof and lower



c) Roof

Fig. 2 Model of transmission

APPENDIX D

**NOISE MEASUREMENT RESULTS FOR MICHAEL JACKSON CONCERT IN FUKUOKA
DOME SUPPLIED BY MITSUBISHI/TAKENAKA**

September 10, 1993

Noise Measurement Result
Michael Jackson Concert in Fukuoka Dome

Daisaku Sho
Research & Development Institute, Takenaka Corporation

1. Date of measurement

20:00 from 19:00 September 10, 1993

2. Measurement item

A-weighted sound pressure level

3. Measurement point

3.1 In dome

PointA ; Spectator seat in front of AV control room ,

PointB; Press seat

3.2 Outside dome

Figure 1 shows measurement points.

Point C; Residential quarter of east side

Point D; River edge of east side

Point E; South side of hospital construction schedule site

Point F; North side of hospital construction schedule site

4. Measurers

Daisaku Sho. Research & Development Institute, Takenaka Corporation

Tetu Hirata, Jousuke Yosida, Hiroaki Takai and Kenji Hiromatu. Kyushuu Branch, Takenaka Corporation

5. Observer

Mr. Iseda and Mr. Morinaka. Twin Dome City Inc.

6. Measurement method

A-weighted sound pressure levels were measured using Noise Level Meters(Rion NL-10).

7. Result of Measurement

A-weighted sound pressure levels measured are shown in Table 1

8. Comment of measurer

Point C Low frequency noise could be heard faintly

Point D The noise from Fukuoka dome, except fireworks sound, couldn't be heard being masked by the noise of wave.

Point C&D The noise from Fukuoka dome couldn't be heard at all

9. Conclusion

The noise level in Fukuoka dome in the concert of this time was about 90-100dBA excluding

fireworks. It is judged that there is no influence in the surrounding at such a noise level at all.

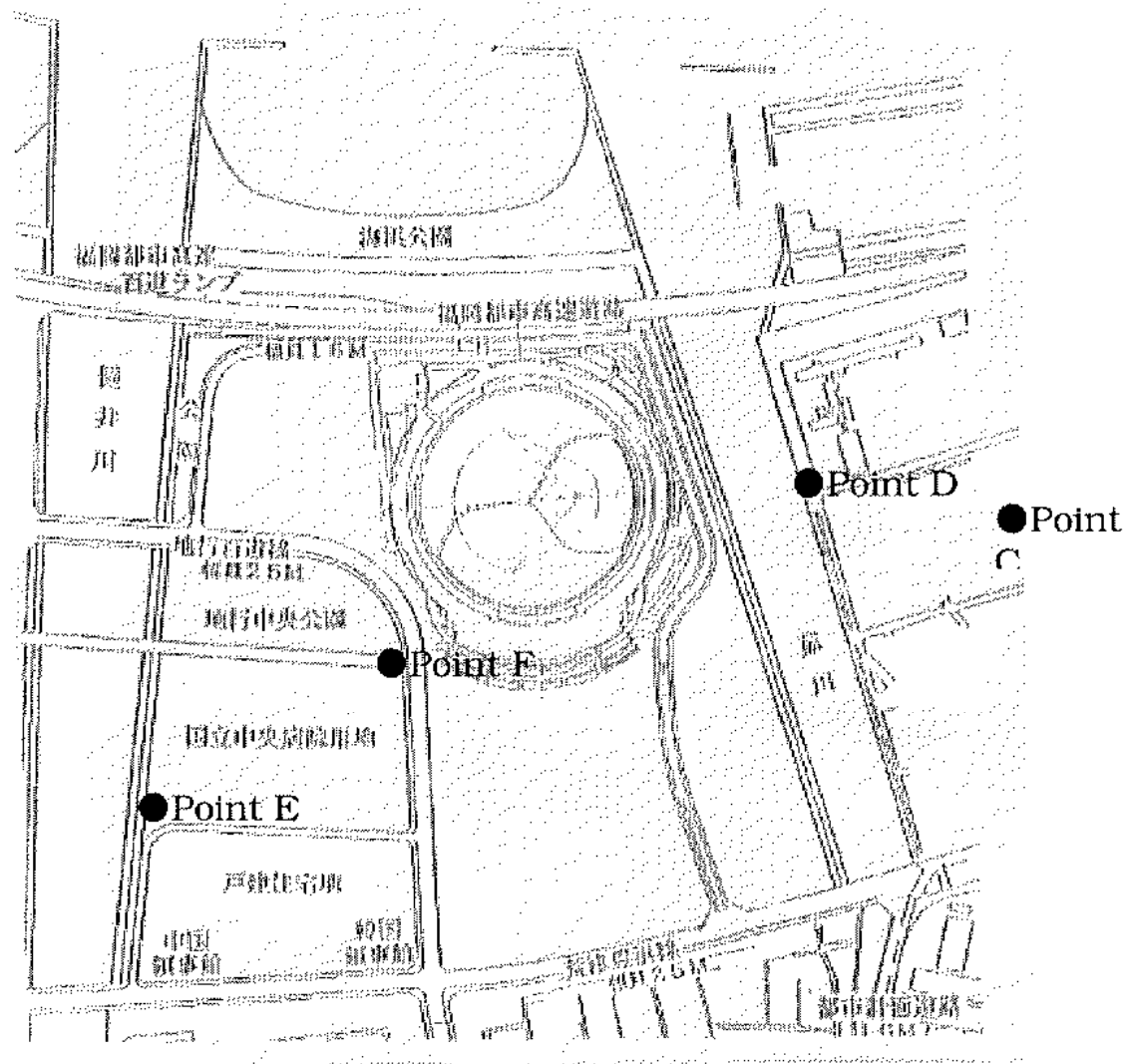


Fig. 1 Measuring points for noise level

Table 1 A-weighted sound pressure levels measured(dBA)

Point	A	B	C	D	E	F
Time						
19:00 ~19:10	—	—	45~52 (BGN)	—	50~57 (BGN)	—

Point Time	A	B	C	D	E	F
19:10 ~19:20	—	—	45~52 (BGN)	—	49~60 (BGN)	—
19:20 ~19:30	90~100 95 on average Fireworks 105	—	45~52 Fireworks 65	—	48~54 Fireworks 56	—
19:30 ~19:40	90~100 95 on average	—	48~50	—	—	54~57
19:40 ~19:50	—	90~100 95 on average Fireworks 102	—	52~54 Fireworks 65	—	53~56
19:50 ~20:00	—	90~100 95 on average	—	52~54	—	52~56

APPENDIX E

PHOTO RECORDS OF SITE CONDITIONS



Photo 1 – Fukuoka Dome (View from 29/F of Sea Hawk Hotel)



Photo 2 – Fukuoka Dome (View from 29/F of Sea Hawk Hotel)



Photo 3 – Roofing material of Fukuoka Dome

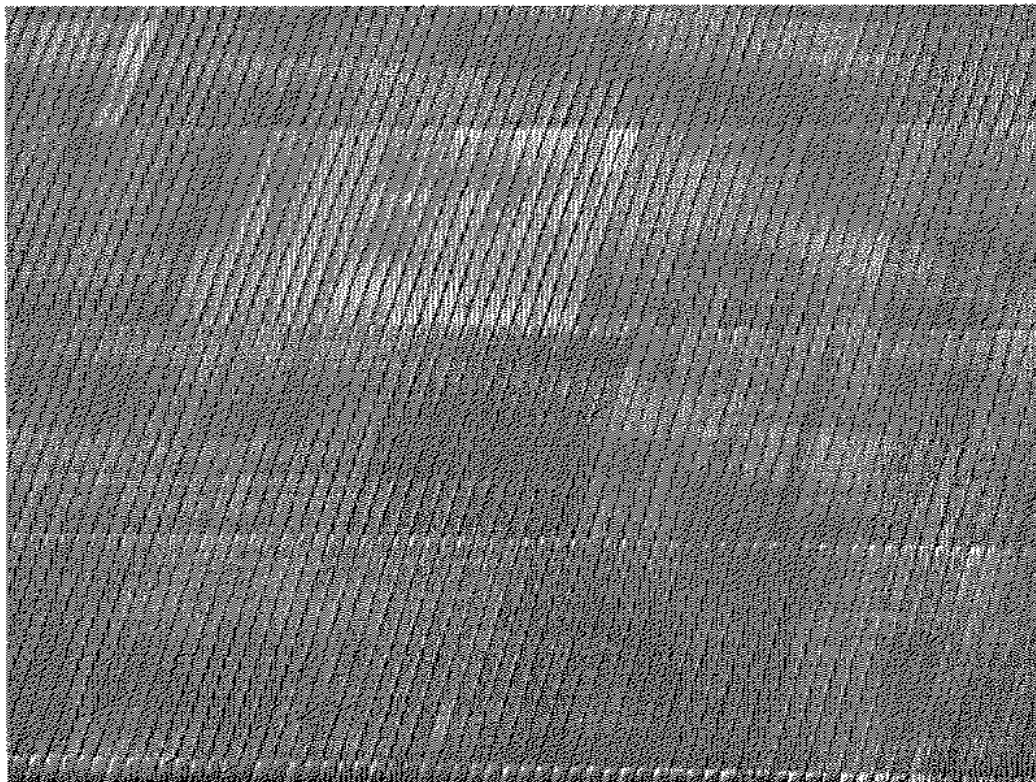


Photo 4 – Roofing material of Fukuoka Dome

Not shown

Photo 7 – Sea Hawk Hotel and Fukuoka Dome

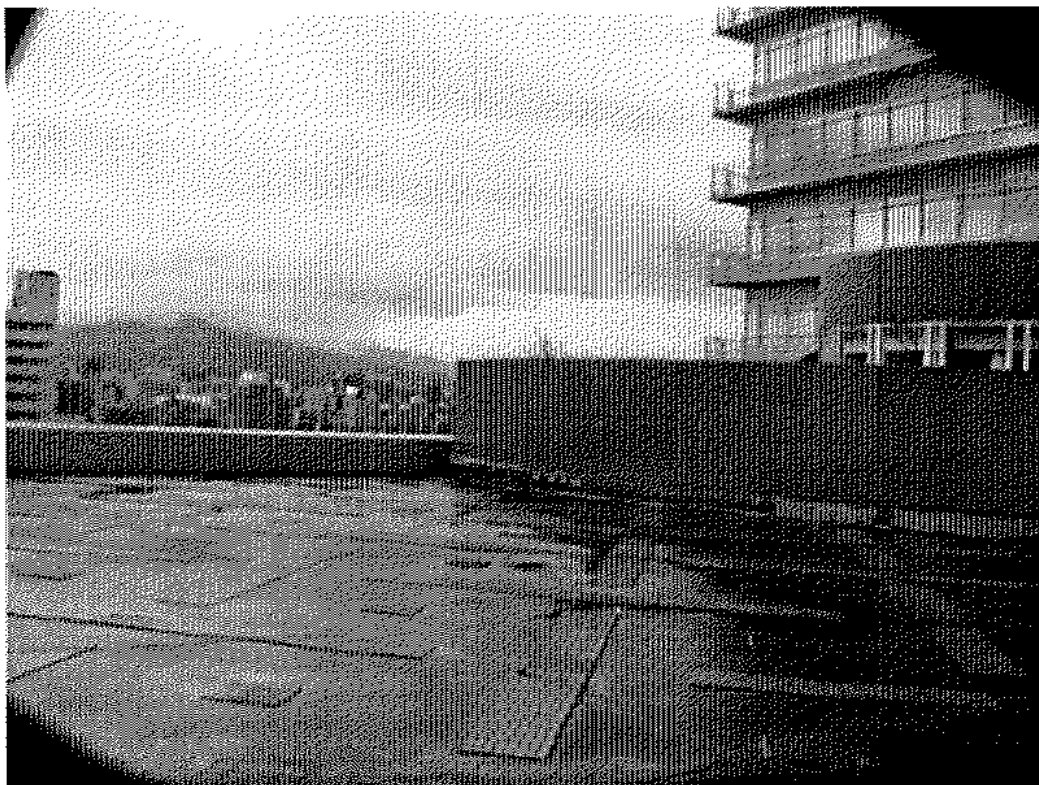


Photo 8 – Balcony of Sea Hawk Hotel (View from podium at 7/F)

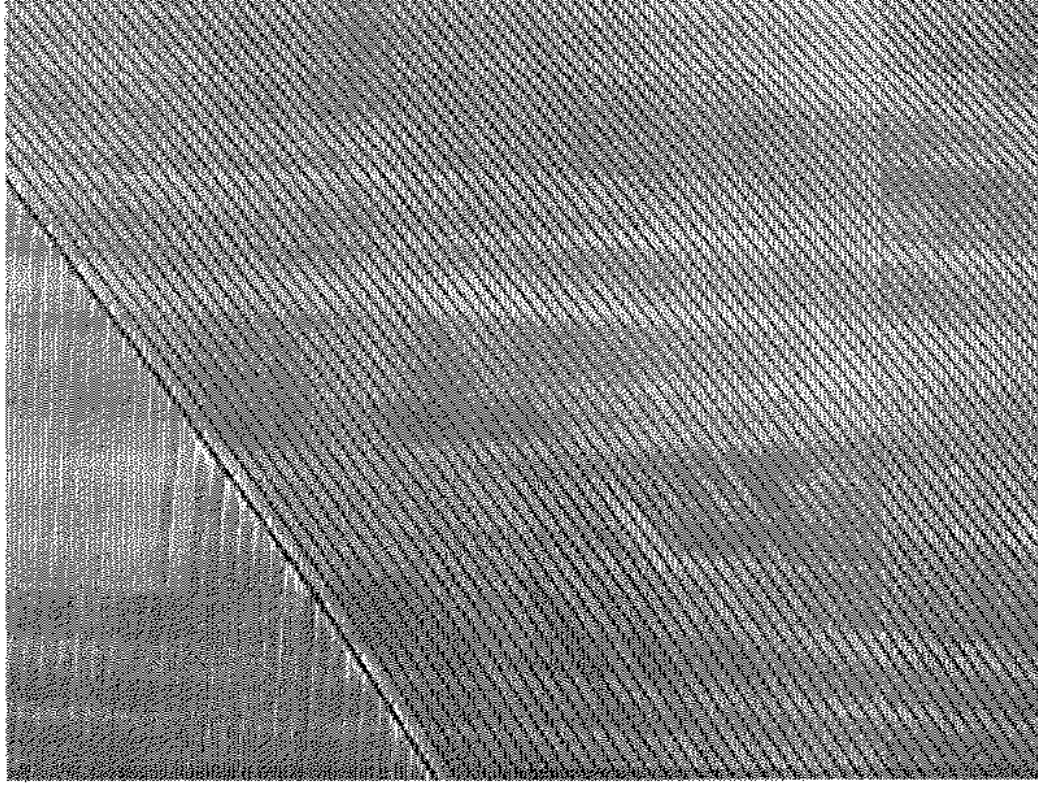


Photo 5 – Roofing material of Fukuoka Dome

Photo 6 – Sea Hawk Hotel

Not shown

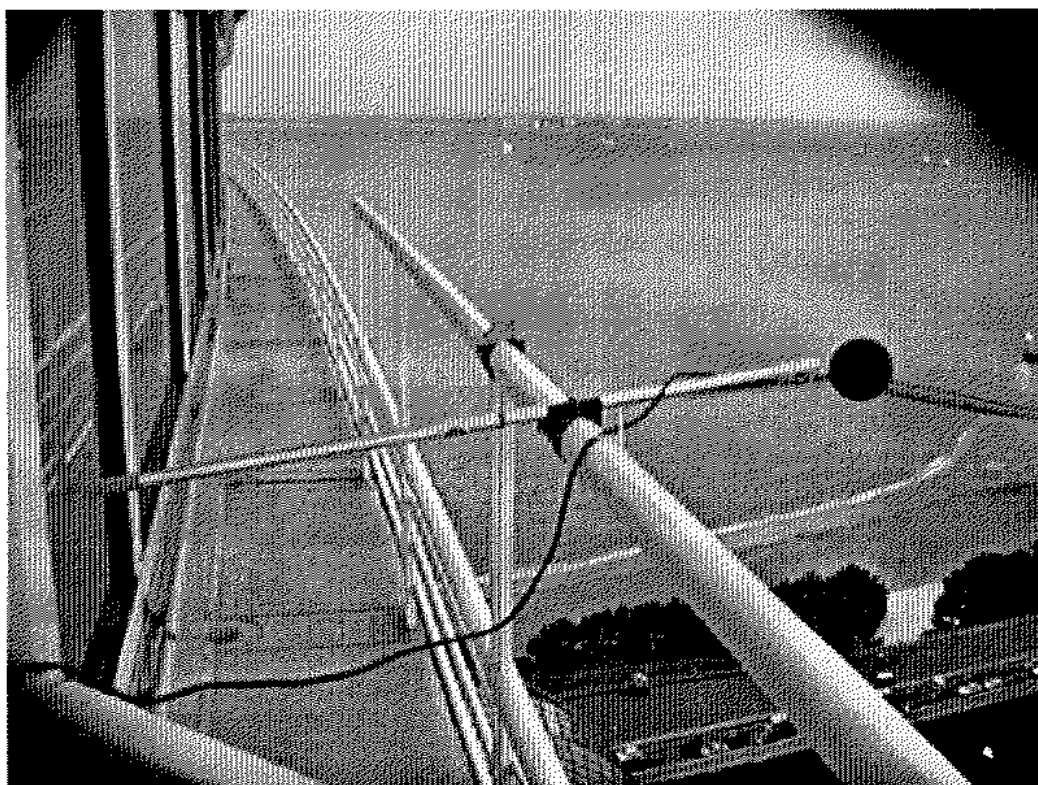


Photo 9 – Location of M1-HE at balcony of 29/F of Sea Hawk Hotel



Photo 10 – Location of M1-HE at balcony of 29/F of Sea Hawk Hotel

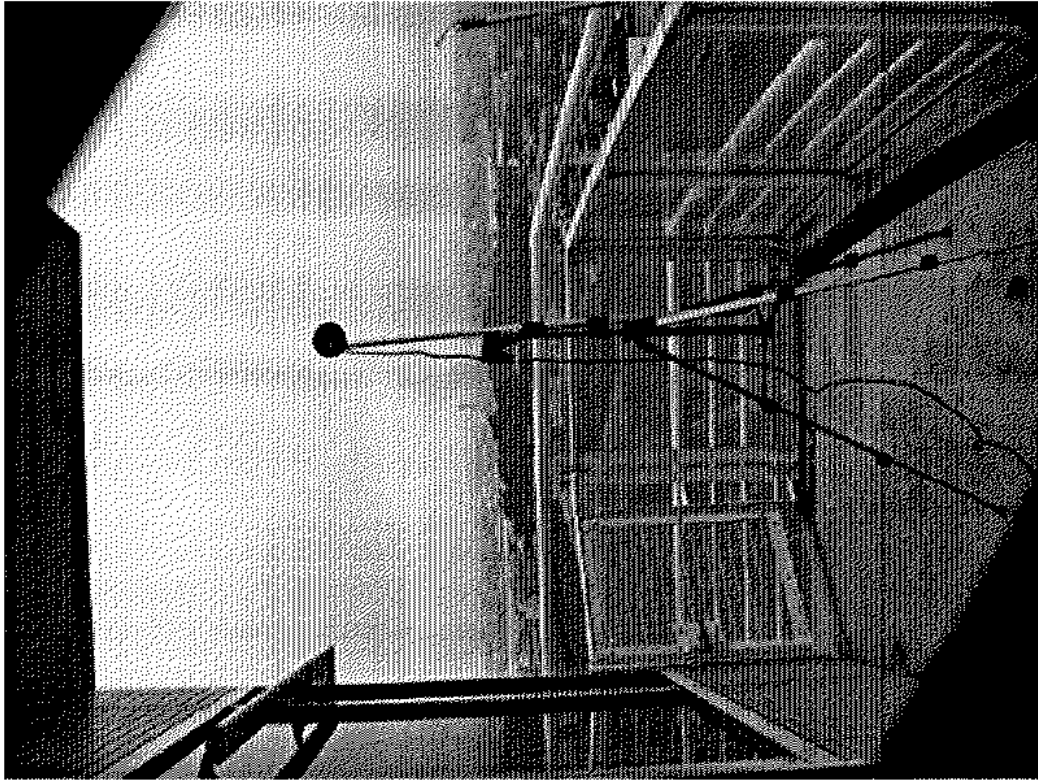


Photo 11 – Location of M1-HS at 29/F of Sea Hawk Hotel

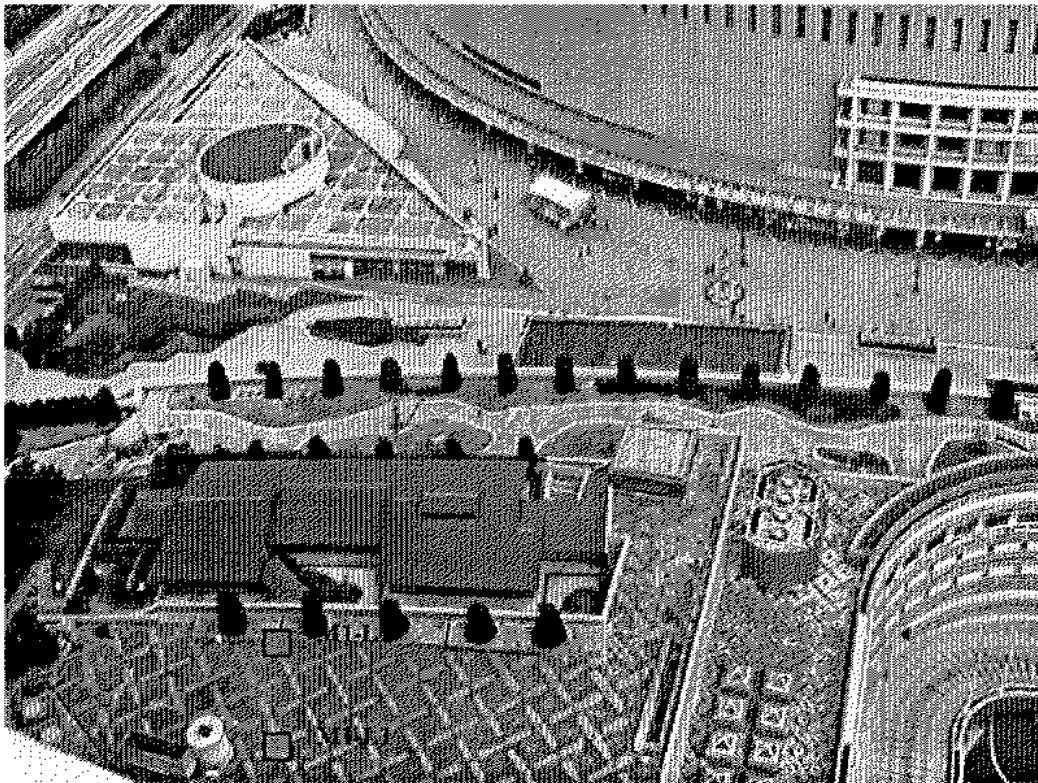


Photo 12 – Location of M1-L1 & M1-L2 at 7/F podium of Sea Hawk Hotel



Photo 13 – Daytime (am) traffic of highway north of dome (View from 29/F at Sea Hawk Hotel)



Photo 14 – Daytime (pm) traffic of highway north of dome (View from 29/F at Sea Hawk Hotel)

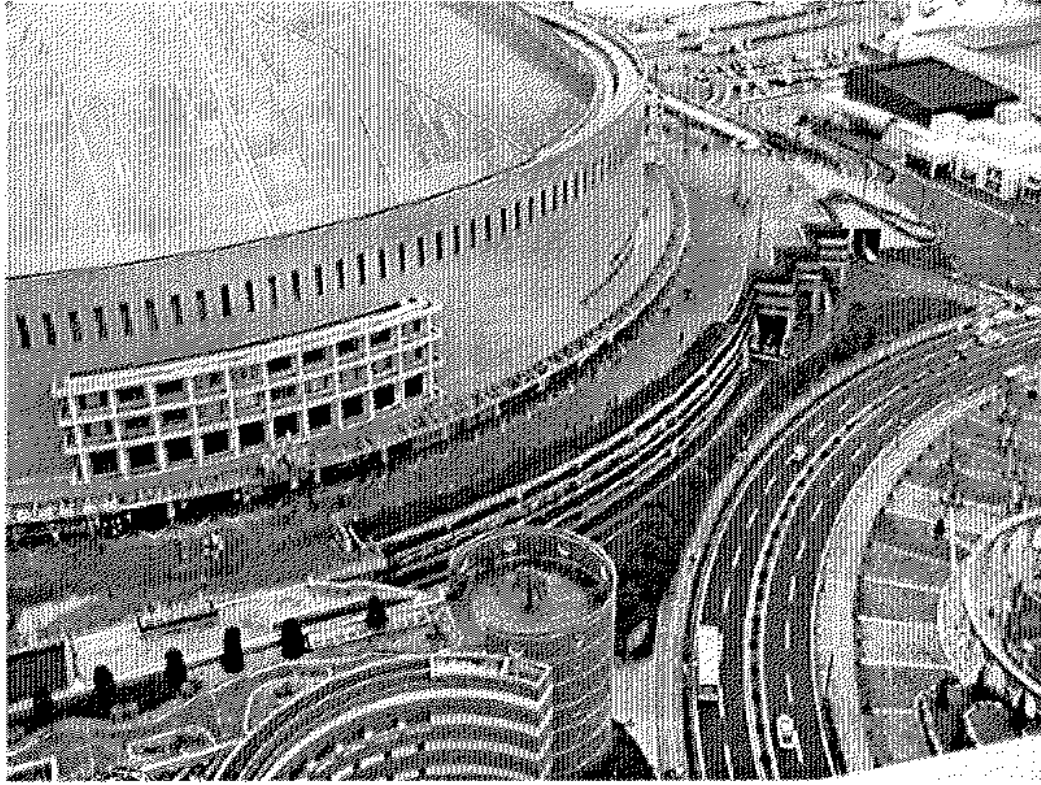


Photo 15 – Daytime (am) traffic of local road south of dome (View from 29/F at Sea Hawk Hotel)

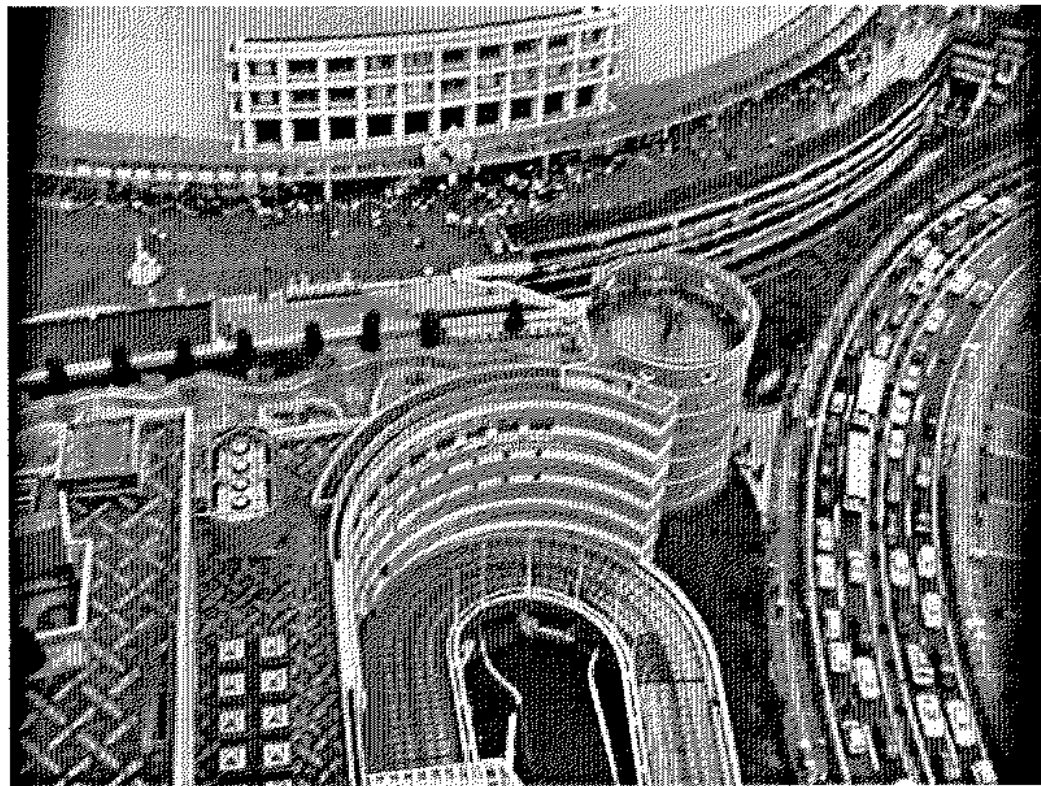


Photo 16 – Daytime (pm) traffic of local road south of dome (View from 29/F at Sea Hawk Hotel)



Photo 17 – Nighttime traffic of highway north of dome (View from 29/F at Sea Hawk Hotel)

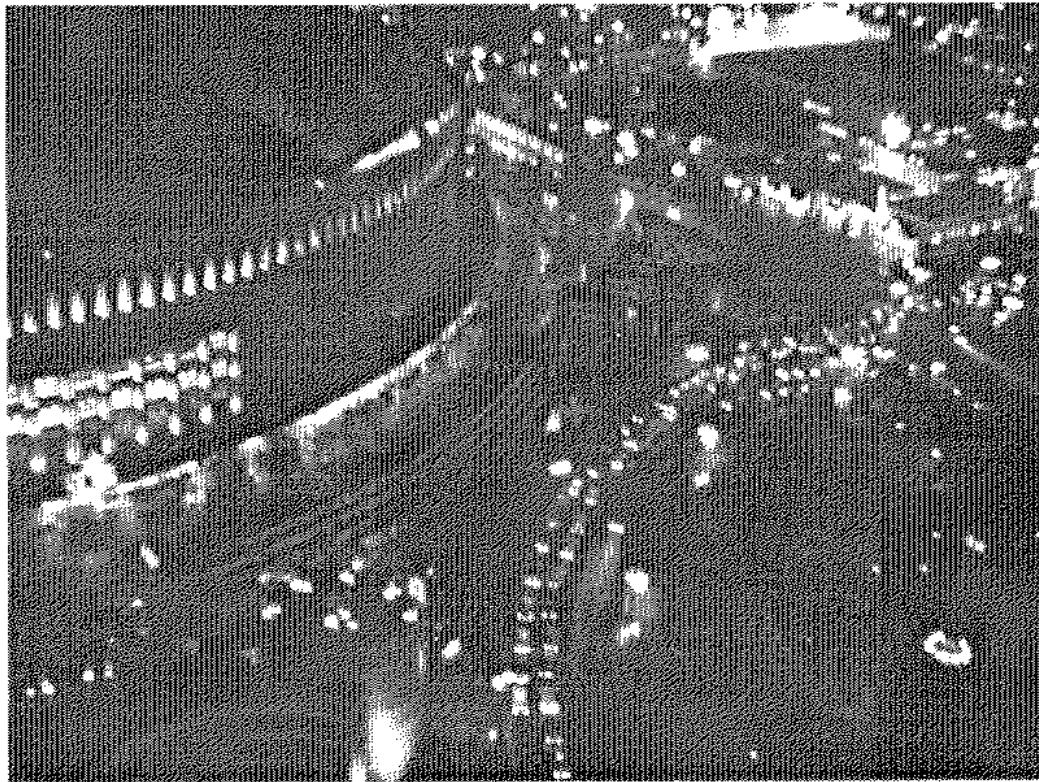


Photo 18 – Nighttime traffic of local road south of dome (View from 29/F at Sea Hawk Hotel)

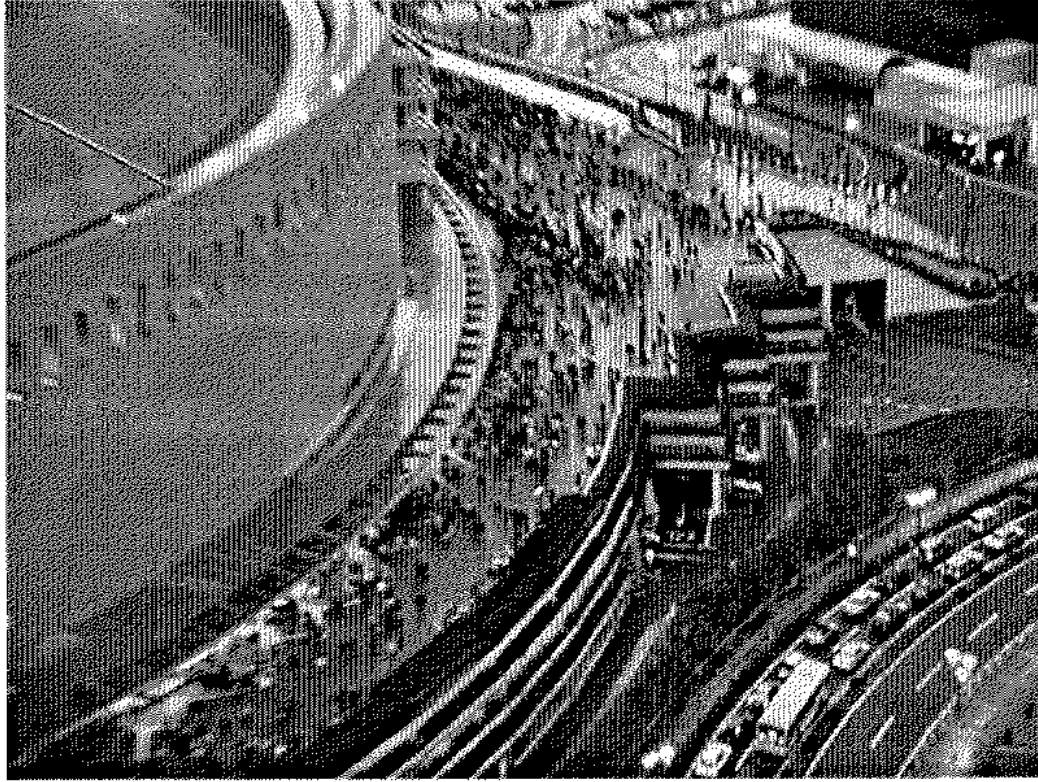
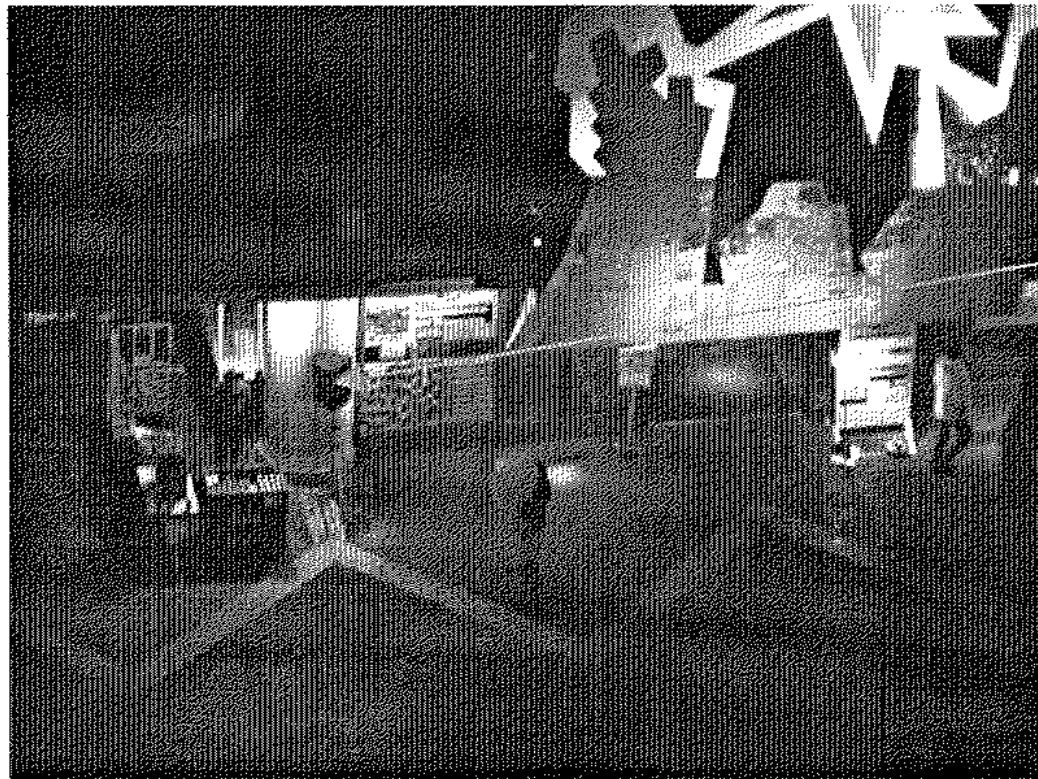


Photo 19 – Crowd lining up to concert at Fukuoka Dome



This loudspeaker broadcasting music which was heard at 29/F at M1-H

Photo 20 – Loudspeaker at the entrance of Fukuoka Dome, outside a pub

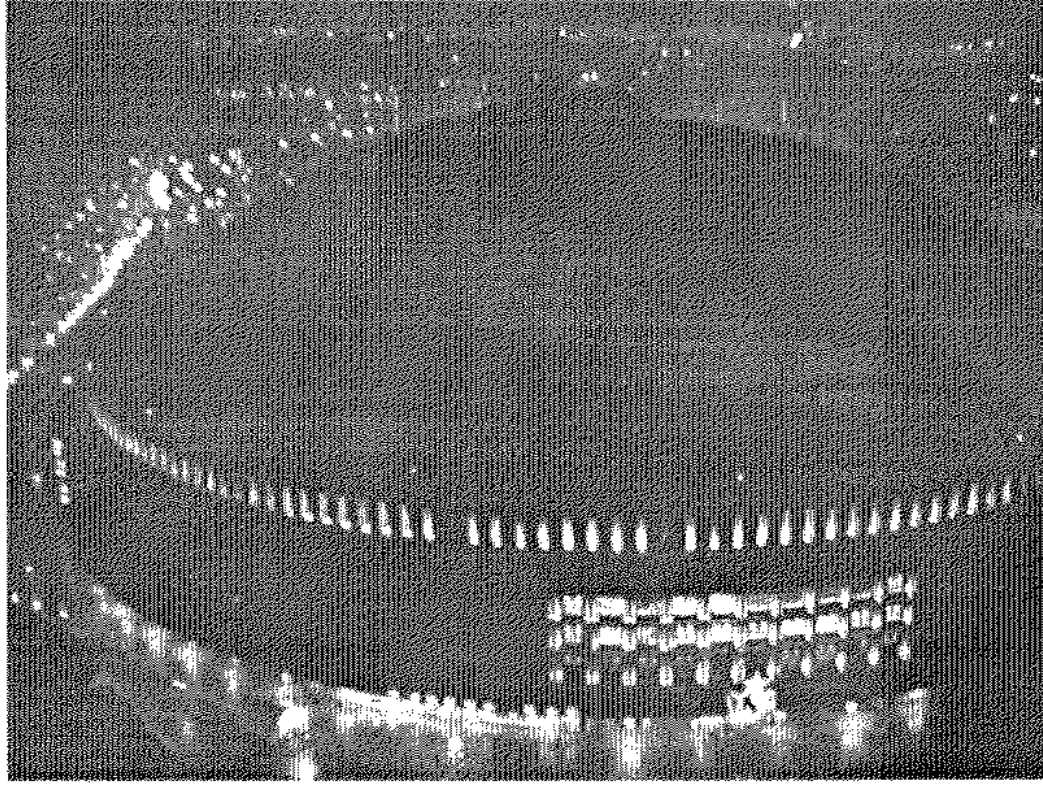


Photo 21 – Concert at Fukuoka Dome at night



Photo 22 – Concert inside Fukuoka Dome

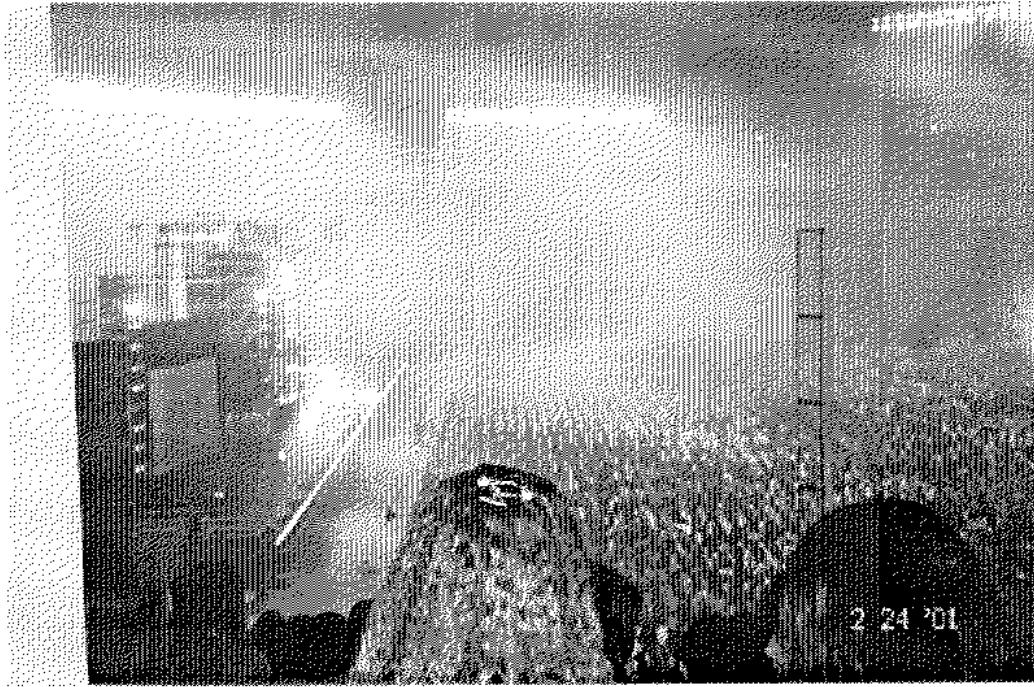


Photo 23 – Concert inside Fukuoka Dome