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***The Study and experience of low
frequency noise control of the
Republic of China (Taiwan)***



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TAIWAN

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1. Introduction

Taiwan



Central authority:

● **Environmental
Protection
Administration, EPA**

**Local government
authority: 23 EPBs**

**24 hours
complaint line**

1. Introduction



- Factories**
- Business places**
- Construction sites**
- Announcement facilities**
- Traffic noise**
- Military noise**
- Others**

The mixed land use urban areas are quite common in Taiwan. 4

2. Current Status

- Number of complaints

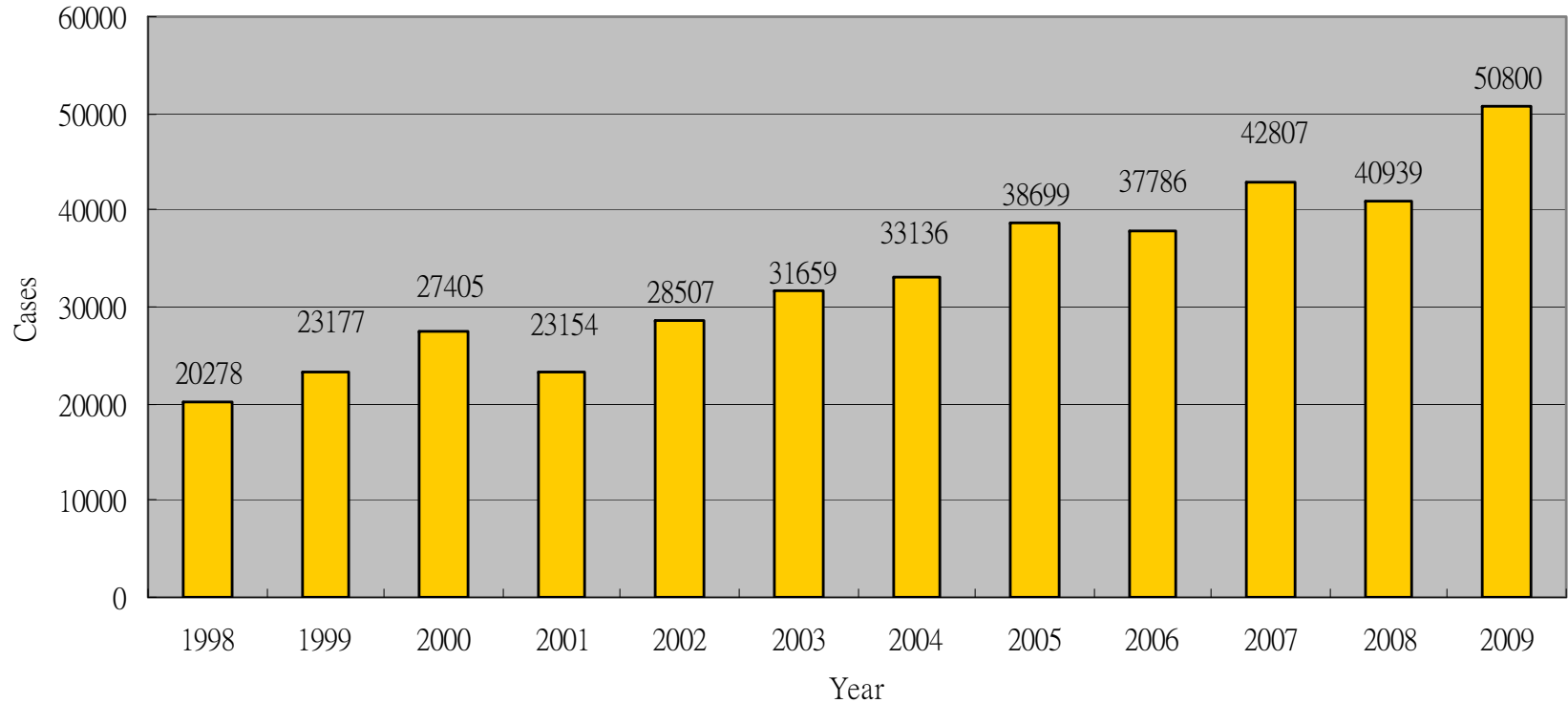


Figure 1: Number of noise complaint from 1998 to 2009

2. Current Status

● Noise sources

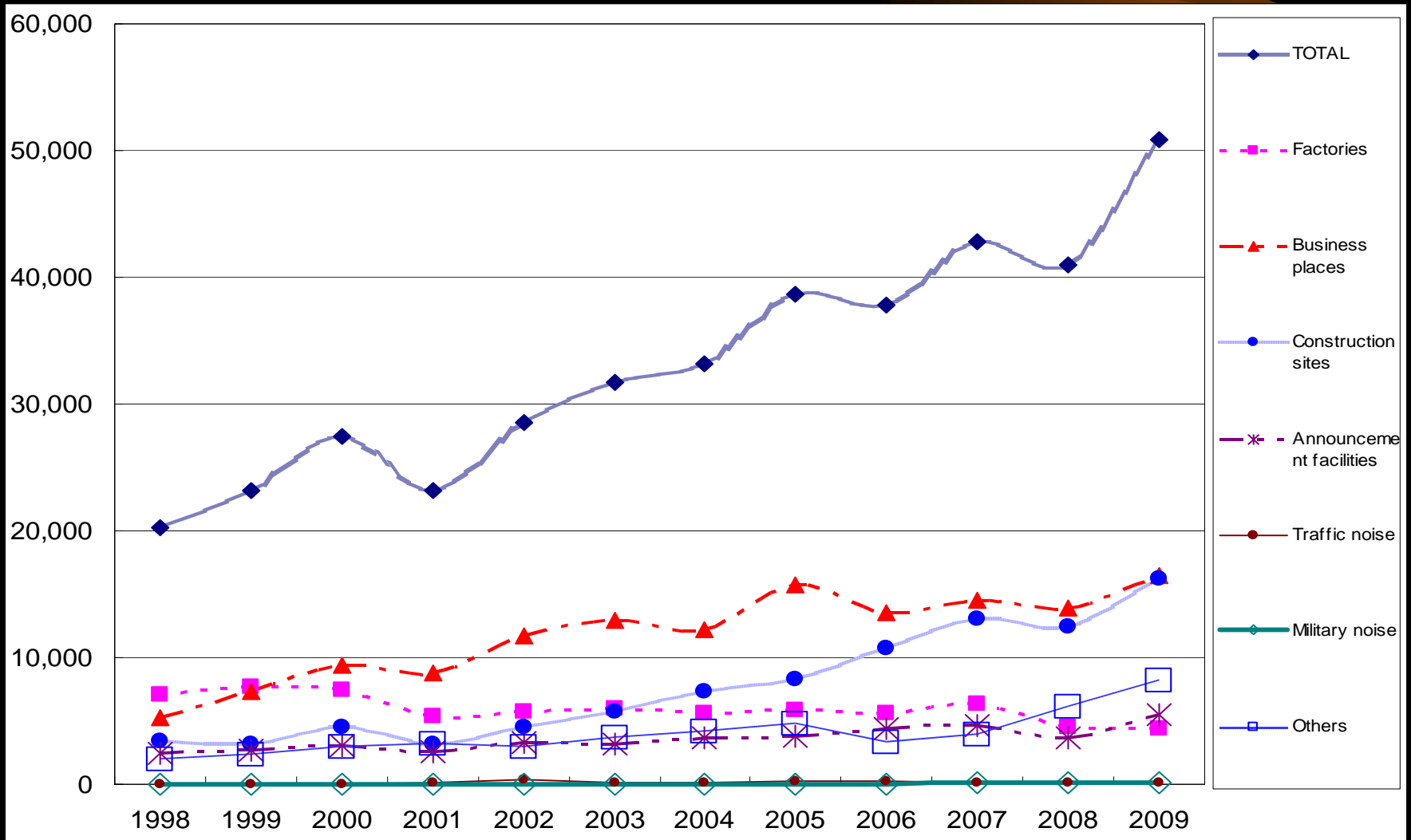


Figure 2: The trend of different noise complaint sources from 1998 to 2009

3. Related Act and Regulations

- **1983: Noise Control Act,**
last amended on Dec 3, 2008.
- **1984: Noise Control Act Enforcement Rules,**
last amended on Mar 11, 2010.

3. Related Act and Regulations

- **Guideline for making Noise Control Zone**

Noise Control Zones are designated by local governments (EPB).

- * **Class 1:**

- For the areas which need very quite environment

- * **Class 2:**

- The areas which mainly use for residential

- * **Class 3:**

- Residential and commercial areas mixed or residential and industrial areas mixed

- * **Class 4:**

- Industrial areas

3. Related Act and Regulations

- **In 1992, Taiwan EPA announced the Noise Control Standard.**
- **The noise emitted from factories, entertainment establishments, business places, construction sites, public announcement facilities shall not exceed the Noise Control Standard within each noise control zone.**

3. Related Act and Regulations

- **2005: Based on the noise complaint cases, the low-frequency (20-200Hz) noise standards for business places and entertainment establishments were set and enforced from Jul,1,2005.**
- **2006: Factories, enforced from Jan,1,2008.**
- **2008: Construction sites, enforced from Jan,1,2009.**
- **2009: The last amendment was announced on Sep, 4, 2009.**

3. Related Act and Regulations

- **Low frequency noise measurement plan**
 - **Indoor points: altitude 1.2 to 1.5m above the ground or floor.**
 - **Doors and windows have to be closed.**



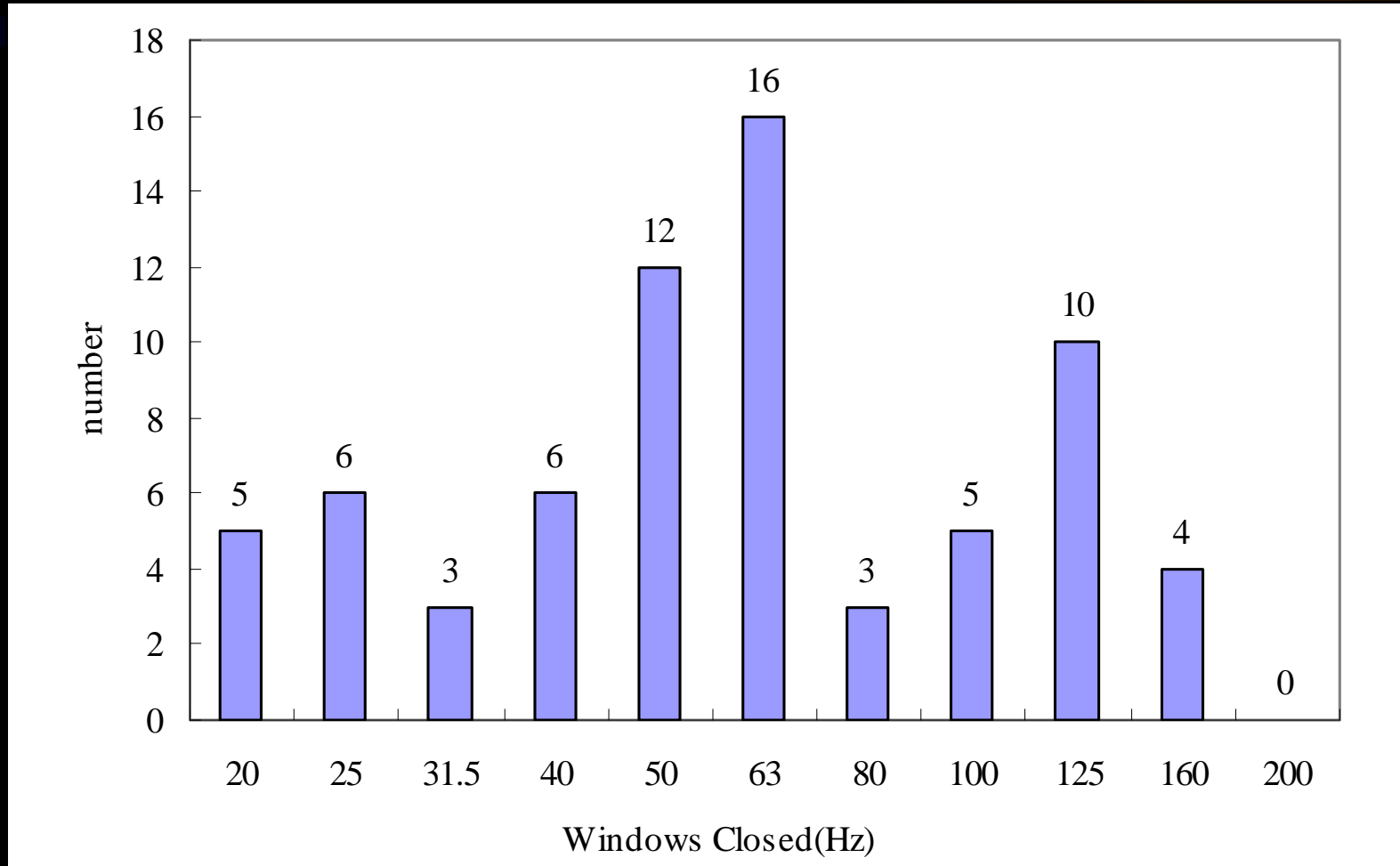
3. Related Act and Regulations



- **Low frequency noise measurement plan**
 - **100 complained points** been measured.
The noise came from business places and entertainment establishments.

3. Related Act and Regulations

- The results of the main low frequency distribution



3. Related Act and Regulations

- The results of different items and volume of the measurement

dB(A)	<30	30-35	36-40	41-45	46-50	>50
Cooling Tower	0	6	30	9	10	5
Air Conditioner	2	3	9	7	2	1
Fan	0	4	2	2	5	3
Total	2	13	41	18	17	9

3. Related Act and Regulations

- The results arrange in decreasing order

	1	2	3	4	5	6	7	8	9	10
0	54.8	53.8	52.1	51.1	50.8	50.8	50.0	49.7	49.6	48.7
10	48.4	47.8	47.3	47.3	47.1	46.9	46.4	46.3	46.2	45.8
20	45.4	45.3	45.2	44.7	44.2	43.8	43.6	43.3	43.2	42.9
30	42.8	42.6	42.3	42.2	41.9	41.1	41.0	40.8	40.7	40.0
40	39.7	39.7	39.4	38.8	38.7	38.7	38.4	38.3	38.3	38.3
50	38.1	38.0	37.7	37.7	37.4	37.2	37.1	37.0	36.9	36.9
60	36.8	36.7	36.7	36.5	36.4	36.0	35.6	35.6	35.4	35.4
70	35.2	35.2	35.0	34.7	34.7	34.6	34.0	33.9	33.9	33.7
80	33.6	33.3	33.2	33.2	32.8	32.8	32.2	31.4	31.2	30.3
90	30.1	29.7	29.7	29.6	29.2	28.8	27.9	27.8	23.4	21.6

Unqualified percentage:

If 40dB(A), will be at about 40%.

If 35dB(A), will be at about 70%.

3. Related Act and Regulations

- Following the study direction and after public hearings, the EPA announced the new amended low frequency Noise Control Standards :
 - entertainment and business premises(31, Jan, 2005)
 - factory plants or sites(8, Nov , 2006)
 - construction sites(25, Feb, 2008)

3. Related Act and Regulations

● The present Noise Control Standards

Time intervals

	Daytime	Evening	Nighttime
Class 1 & Class 2	06:00-20:00	20:00-22:00	22:00-06:00
Class 3 & Class 4	07:00-20:00	20:00-23:00	23:00-07:00

3. Related Act and Regulations

- Instrumentation:

According to the modification of **CNS No. 7129** of standards for sound level meter, the Noise Control Standard amended the relevant content and mentioned the IEC 61260 for low-frequency noise measurement.

- Period of observation

Measurement shall be made **at the time when the noise generated is most representative** or at the time designated by the applicant concerned.

3. Related Act and Regulations

● Measurement Position

● If the low-frequency noise will be measured, the measurement position has to be located indoors and where the air conditioners, fans, refrigerators should be turned off and the doors and windows have to be closed.

3. Related Act and Regulations

- Noise standards for factories/business places/construction site

Overall: 20Hz-20kHz, dB(A)

	Daytime	Evening	Nighttime
Class 1	50/55/70	45/50/50	40/40/50
Class 2	60/60/70	55/55/60	50/50/50
Class 3	70/70/75	60/60/70	55/55/65
Class 4	80/80/80	70/70/70	65/65/65

3. Related Act and Regulations

- Noise standards for factories/business places/construction site

Low frequency: 20-200Hz, dB(A)

Noise Control Zone	Factory			Business places and entertainment establishments			Construction site		
	Daytime	Evening	Nighttime	Daytime	Evening	Nighttime	Daytime	Evening	Nighttime
Class 1 & Class 2	42	42	39	35(40)	35	30	47	47	42
Class 3 & Class 4	47	47	44	40	40	35	49	49	44

4. Low Frequency Control

- The EPA has held several meetings to explain the low frequency noise standards and measurement method in public.



- As of the end of 2009, a total of 18,235 cases were inspected national-wide. Non-compliance with low frequency noise level standards was found in 1,590 cases. If the cases in the non-compliance rate was 8.7%, which was about 2 times that of general noise level standards.

4. Low Frequency Control

- This indicates that LFN indeed has adverse impact on people's life and it is a correct direction to control the low frequency noise.
- Since low frequency noise is highly penetrable, and it is more difficult to assess the level of nuisance it causes, EPA has required EPBs to reinforce noise improvement plans.
- The number of low frequency noise complaints has thus consequently been reduced by about 20%.

4. Low Frequency Control

● Other low frequency noise sources



Traffic

- ✓ expressways
- ✓ highways
- ✓ ordinary roads
- ✓ high speed trains (THSRC)
- ✓ ordinary trains
- ✓ mass rapid transit (MRT)

Wind turbines generator systems



4. Low Frequency Control

● Counselling of repeated noise complaints cases

• excavators

- The overall L_{eq} in front of the building was 74.5dB(A) and the $L_{eq}(20-200\text{Hz})$ was 61.0dB(A).
- Because the area of the construction site was small, the reflection noise became the main cause.
- The 1/3 octave 100Hz was the main frequency between 20-200Hz.

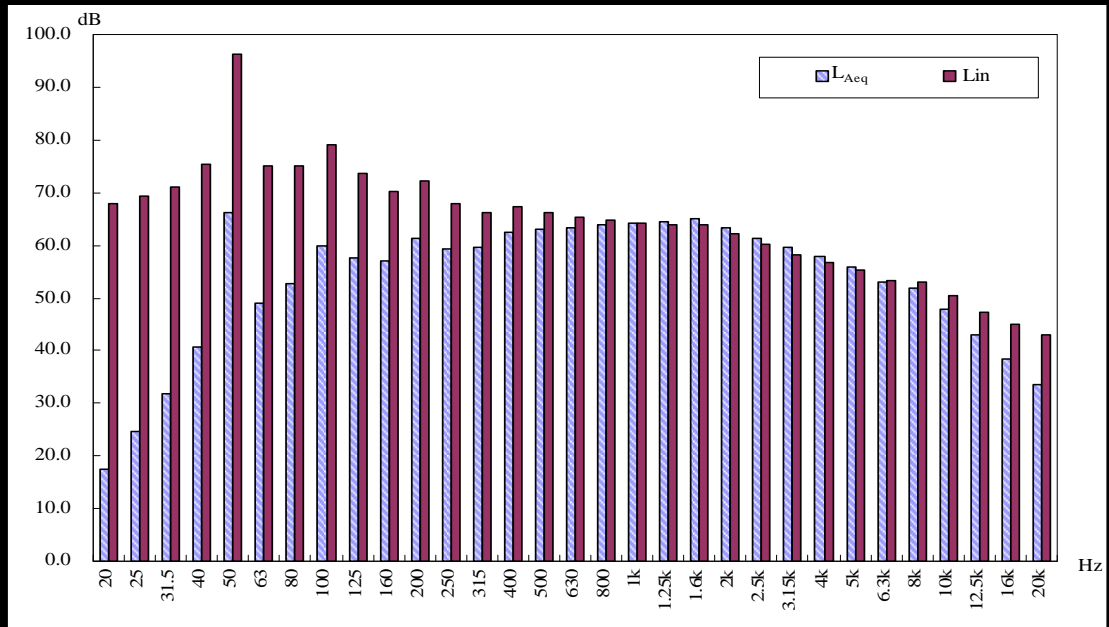


4. Low Frequency Control

● Counselling of repeated noise complaints cases

• generators

- The overall L_{eq} in front of the building was 75.1dB(A) and the L_{eq} (20-200Hz) was 68.9dB(A).
- Because the window of the generator were open and faced to the dwellings, the noise affected the dwellings.
- The 1/3 octave 50Hz was the main frequency between 20-200Hz.



5. Conclusion

- For a better living environment, it is important to control the noise sources such as factories, business places, construction sites, vehicles, airports and so on.
- Not only making the stricter standards , but also EPA has tried to reduce the noise complaints by different ways to solve the noise problem .
- We EPA will continue to revise and discuss the noise standards to control the noise emitted from noise producers and let us get a better living quality.

*Thank you so much for your
attention !!*

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