KEK-GM measurements (2)

KEK: Hiroshi Yamaoka, Ryuhei Sugahara, Shigeru Takeda and Masakazu Yoshioka
University of Tokyo: Satoru Yamashita
Electric Power Development Co., Ltd.: Takashi Ito, Yoshinori Nakayama

Contents

- Introduction
- Sensor check
- Results at D3-hall
- Coherency at four points
- Conclusion
Introduction

○ GM measurements
1. SYN-GL(On the ground)
   D9, D12, D3, OHO
   → Coherency: Presented!
2. SYN-UG(-10m)
   D9, D12, D3, OHO
3. IND-D09
   P1, P2, P3, P4
4. IND-D03
   P1, P2, P3, P4
   → Presented!
5. IND-OHO
   P1, P2, P3, P4
1.～5.: Including Vibration tests
   V01-V06
Sensor Test

# of seismometer: 4
Sampling: 100Hz
Data taking: 600sec. x 5 times

VSE-355 G2
(Tokyo sokushin co. Ltd.) x 4
- Velocity Seismometer (Tri-axial)
- Frequency range: 0.012 – 70Hz
- Clip levels: ±200cm/s ±2000cm/s²
- Sensitivity: 100mV/(cm/s)
- Max. output voltage: ±20V
- Resolution: 10⁻⁶gal
Coherency

P1

P2

P3

P4

N-S

E-W

U-D

Coherency

Frequency (Hz)

P1NS-P2NS

P1EW-P2EW

P1UD-P2UD

P3NS-P4NS

P3EW-P4EW

P3Z-P4Y
Measurement(@D3-hall)

**Sampling:** 100Hz
**Data taking:** 600sec./hr x 24 times

0:00AM – 0:10AM
1:00AM – 1:10AM

・ ・ ・
11:00PM – 11:10PM
Power Spectrum Density

P1(1:00AM, 10:00AM)

P2(1:00AM, 10:00AM)

P3(1:00AM, 10:00AM)

P4(1:00AM, 10:00AM)
Integrated Amplitude

P1(1:00AM, 10:00AM)

P2(1:00AM, 10:00AM)

P3(1:00AM, 10:00AM)

P4(1:00AM, 10:00AM)
**Direction: UD**

- **> 0.1Hz**
  - 1:00AM (red squares)
  - 10:00AM (blue squares)

- **> 1.0Hz**
  - 1:00AM (red squares)
  - 10:00AM (blue squares)

- **> 10Hz**
  - 1:00AM (red squares)
  - 10:00AM (blue squares)

(Log scale)

- **P1**: 10m
- **P2**: GL
- **P3**, **P4**: D3

- **Higashi-Odori (Boulevard)**

- **> 0.1Hz**
  - 1:00AM (red squares)
  - 10:00AM (blue squares)

- **> 1.0Hz**
  - 1:00AM (red squares)
  - 10:00AM (blue squares)

- **> 10Hz**
  - 1:00AM (red squares)
  - 10:00AM (blue squares)
Coherency

Direction: UD(0:00AM)
Ratio between two points
(Linear spectrum: A-B)

Direction: UD(0:00AM)
H/V Spectrum Ratio

→ To know resonant frequency of soil
Coherency between four buildings → Preliminary

Data: 0:00AM

D3-OHO (350m)

D9-D12 (670m)

D12-OHO (800m)

D9-OHO (825m)

D9-D3 (1000m)

Distance between two points (m)

200 400 600 800 1000 (m)
Conclusion

Analyses are still being progressed.
Complete results will be presented at another opportunity.

Measurement(@D3-hall)

- Comparison between the quiet/noisy time.
  → P.S.D: 1 – 2 order different
- Integrated Amplitude
  → It seems that traffic noise is caused by truck/big truck rather than car.
- Coherency
  → There is a coherency below 1Hz.

Coherency between four buildings
→ Good coherency below 0.3Hz.
→ There is a coherency difference. But not so large between four buildings(D9, D12, D3, OHO).

<table>
<thead>
<tr>
<th>Integrated Amplitude (nm) @D3-Hall</th>
<th>&gt;0.1Hz</th>
<th>&gt;1.0Hz</th>
<th>&gt;10Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1-NS:</td>
<td>229</td>
<td>164</td>
<td>86</td>
</tr>
<tr>
<td>-EW:</td>
<td>237</td>
<td>161</td>
<td>120</td>
</tr>
<tr>
<td>-UD:</td>
<td>274</td>
<td>137</td>
<td>236</td>
</tr>
<tr>
<td>P2-NS:</td>
<td>281</td>
<td>168</td>
<td>201</td>
</tr>
<tr>
<td>-EW:</td>
<td>251</td>
<td>156</td>
<td>152</td>
</tr>
<tr>
<td>-UD:</td>
<td>303</td>
<td>134</td>
<td>271</td>
</tr>
<tr>
<td>P3-NS:</td>
<td>330</td>
<td>170</td>
<td>260</td>
</tr>
<tr>
<td>-EW:</td>
<td>287</td>
<td>161</td>
<td>228</td>
</tr>
<tr>
<td>-UD:</td>
<td>316</td>
<td>144</td>
<td>285</td>
</tr>
<tr>
<td>P4-NS:</td>
<td>444</td>
<td>199</td>
<td>380</td>
</tr>
<tr>
<td>-EW:</td>
<td>682</td>
<td>202</td>
<td>341</td>
</tr>
<tr>
<td>-UD:</td>
<td>477</td>
<td>159</td>
<td>381</td>
</tr>
</tbody>
</table>