

## VI. KESIMPULAN

Pada percobaan simulasi numerik yang dilakukan terhadap setiap tipe variabel fisik dapat diambil kesimpulan bahwa penggunaan setiap variabel fisik memiliki kecenderungan untuk menaikan atau menurunkan nilai parameter ukur kualitas akustika ruang. Temuan mengenai percobaan simulasi variabel fisik secara numerik dapat dilihat pada kesimpulan bab IV.

Penerapan variabel fisik pada objek studi yang dilakukan adalah (1) dengan memanfaatkan koridor sebagai variabel volume menggunakan partisi lipat dengan material akustik sebagai pembatas, (2) bidang plafon tengah yang datar digunakan untuk variabel referberant chamber jika bidang tersebut diturunkan dengan sistem mekanik, sekaligus menambah volume ruang, dan (3) kombinasi material penyerap-diffuse-pemantul yang dapat rubah dengan tiga variasi (Lampiran 13) pada dinding yang dapat dirubah dari jenis penyerap ke jenis penyebar dan pemantul bunyi. Penerapan variabel fisik disesuaikan antara temuan pada percobaan numerik dengan kebutuhan besaran nilai parameter akustik ruang.

Penerapan hasil percobaan simulasi numerik pada objek studi menunjukan bahwa variasi variabel fisik yang diterapkan pada objek fisik mampu memberikan perubahan kualitas akustik ruang sesuai kebutuhan fungsi olah raga, pidato dan musical. Rata-rata nilai  $RT_{60}$  pada model pidato berada pada rentang nilai 1.33 - 1.59 detik, sedangkan pada model musik progresif sebesar 1.56 - 1.78 detik, kemudian pada model musik orkestra berada pada kisaran angka 1.84 – 2.10 detik. Rata-rata nilai STI juga cenderung menurun seiring dengan kenaikan nilai

$RT_{60}$  meskipun dengan rata-rata penurunan nilai yang tidak signifikan. Perubahan nilai parameter akustika ruang sangat dirasakan oleh pendengar atau area yang dekat dengan lokasi penambahan variabel fisik. Nilai G sebagai parameter yang ditinjau pada fungsi olah raga juga menunjukkan nilai jauh dibawah nilai maksimum yang disarankan.

Berbagai kendala usaha menerapkan variabel fisik dalam desain objek studi mengarah pada kesimpulan bahwa usaha untuk menyediakan ruang yang dapat memberikan pengalaman kualitas akustik beragam dapat dilakukan dengan diskusi mendalam pada saat awal perencanaan agar penerapan variabel fisik tidak terbentur dengan keterbatasan desain yang sudah berkembang jauh.

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Sumber Internet

<http://www.mh-audio.nl/AcousticGlossary.asp#anchor564875>

Penjelasan mengenai istilah-istilah akustika.

<http://www.purebits.com/appnote11.html#par4>

Penjelasan mengenai istilah-istilah akustika.

[http://www.acoustic.ua/forms/SchDiff\\_out.en.html](http://www.acoustic.ua/forms/SchDiff_out.en.html)

Menghitung desain diffusor dan beberapa teori dasar akustika.

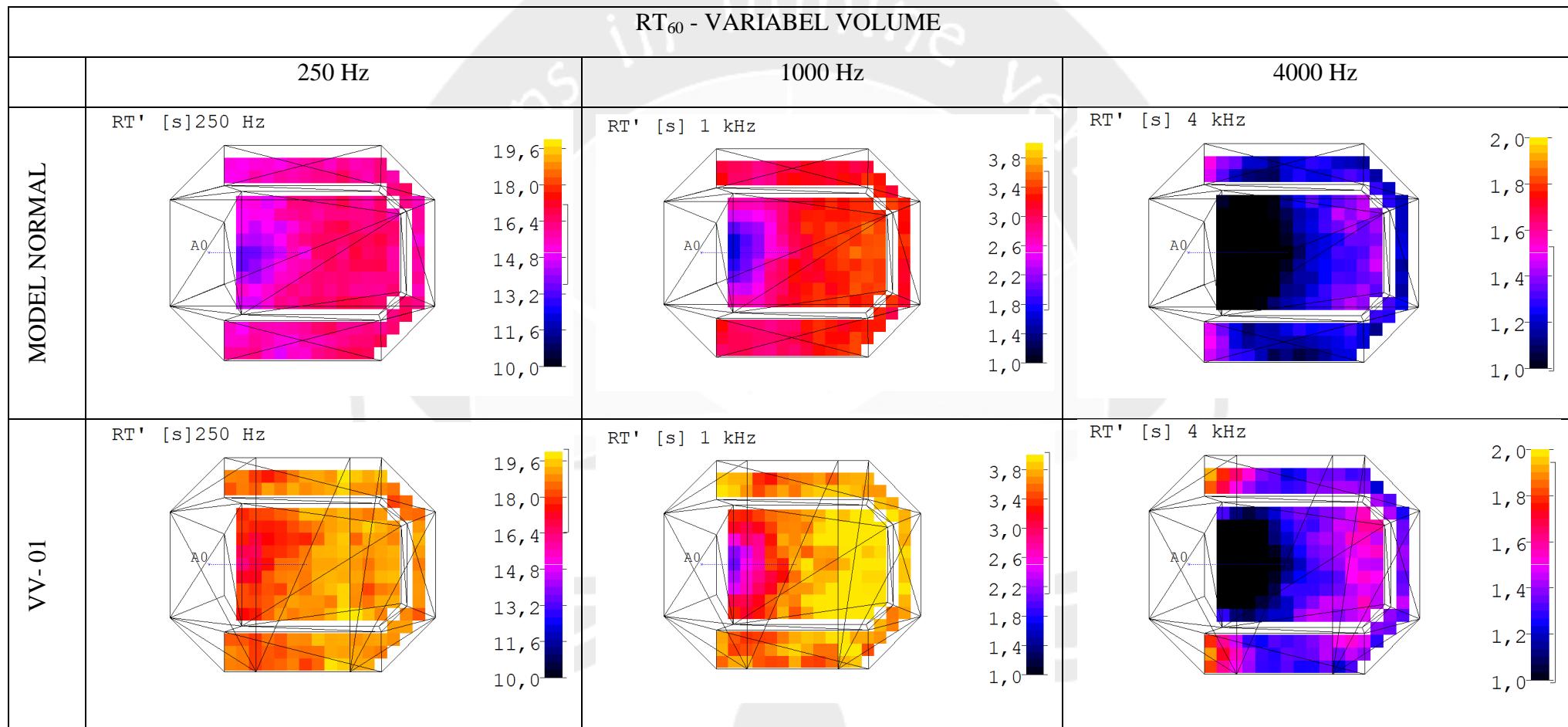
[http://www.akutek.info/concert\\_hall\\_acoustics.htm](http://www.akutek.info/concert_hall_acoustics.htm)

Parameter rujukan untuk akustika ruang pentas.

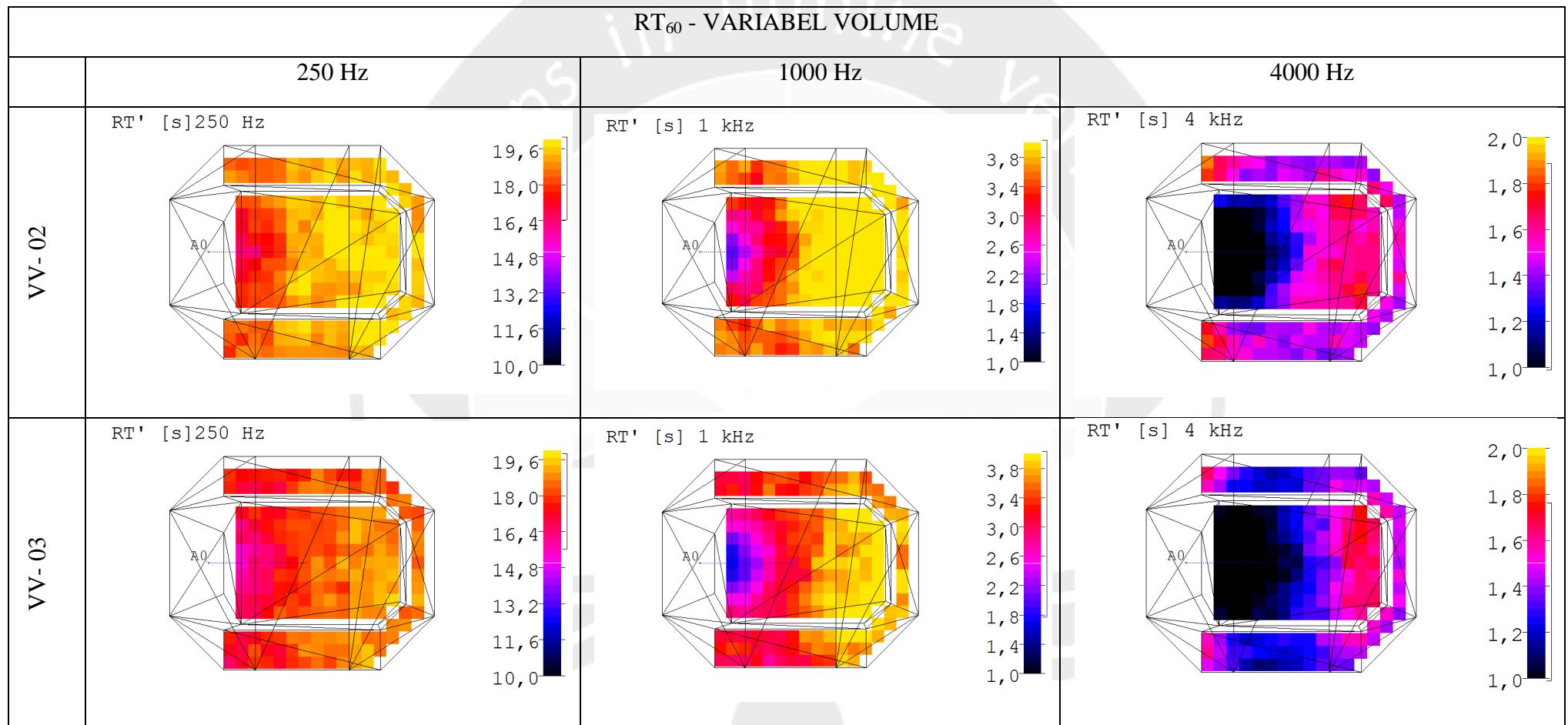


## LAMPIRAN

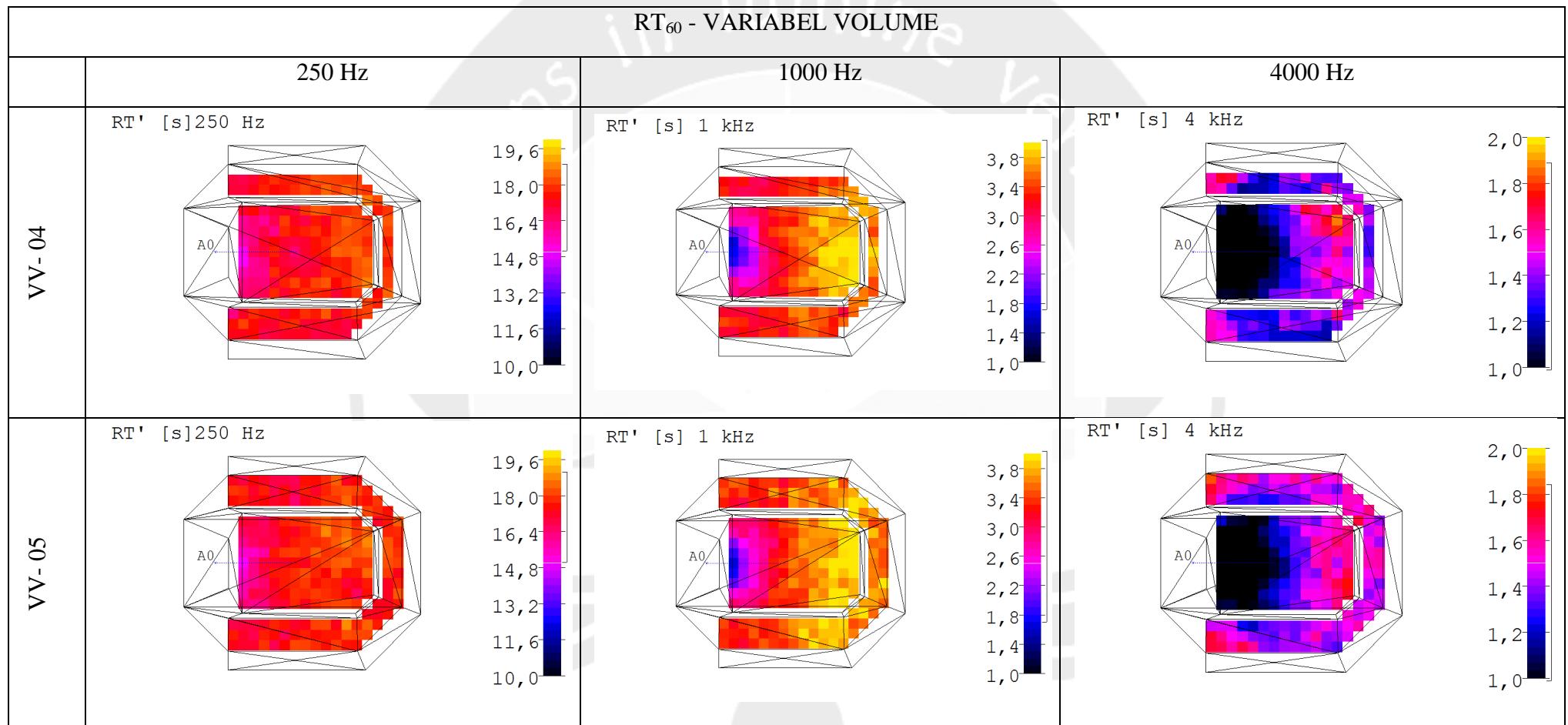
Lampiran 1: Mapping nilai RT<sub>60</sub> pada variasi model variabel volume



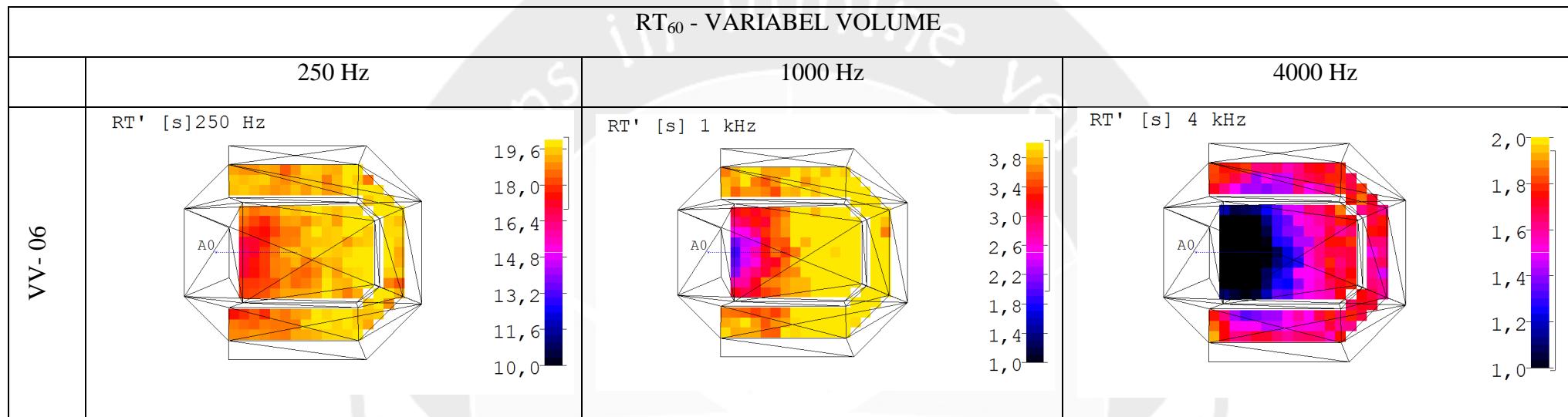
Lampiran 1 (lanjutan): Mapping nilai RT<sub>60</sub> pada variasi model variabel volume



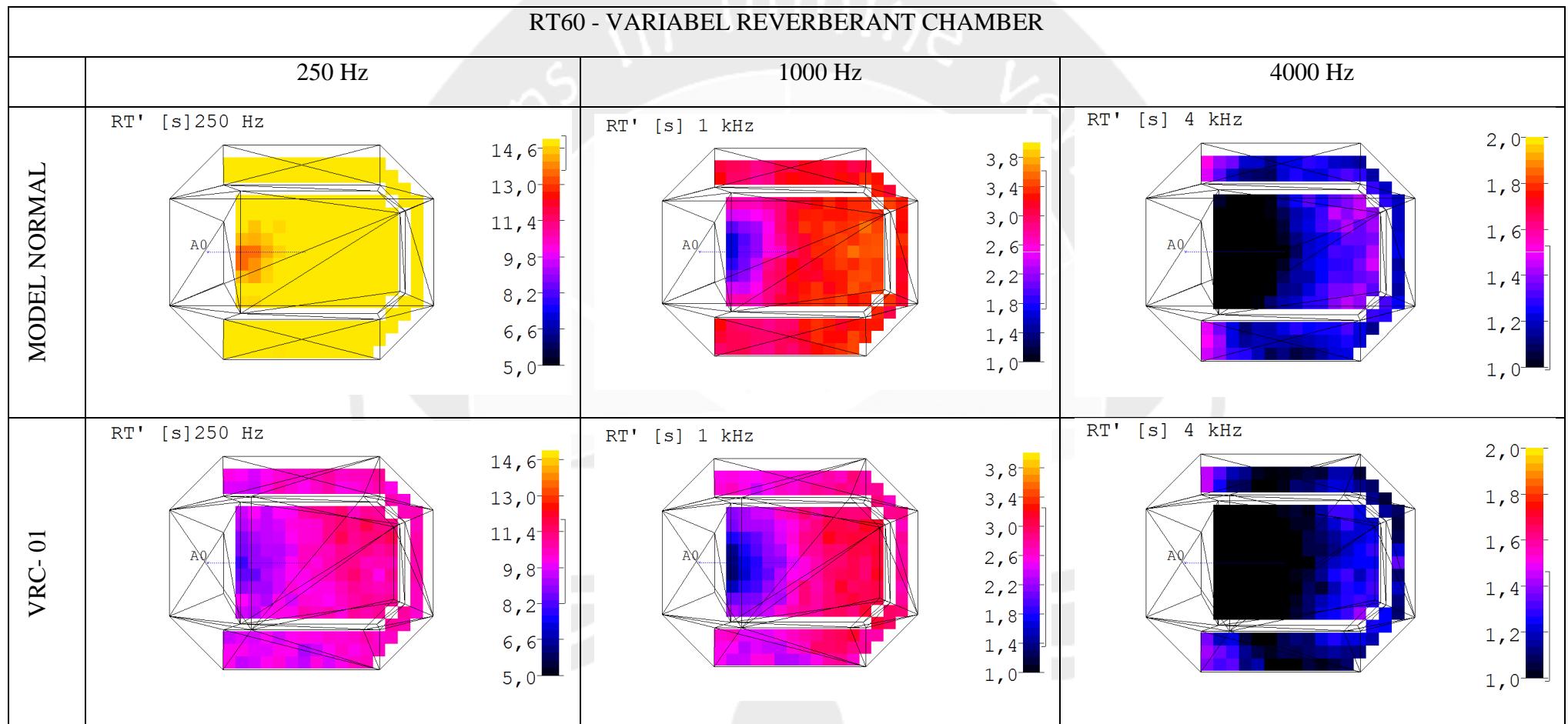
Lampiran 1 (lanjutan): Mapping nilai RT<sub>60</sub> pada variasi model variabel volume



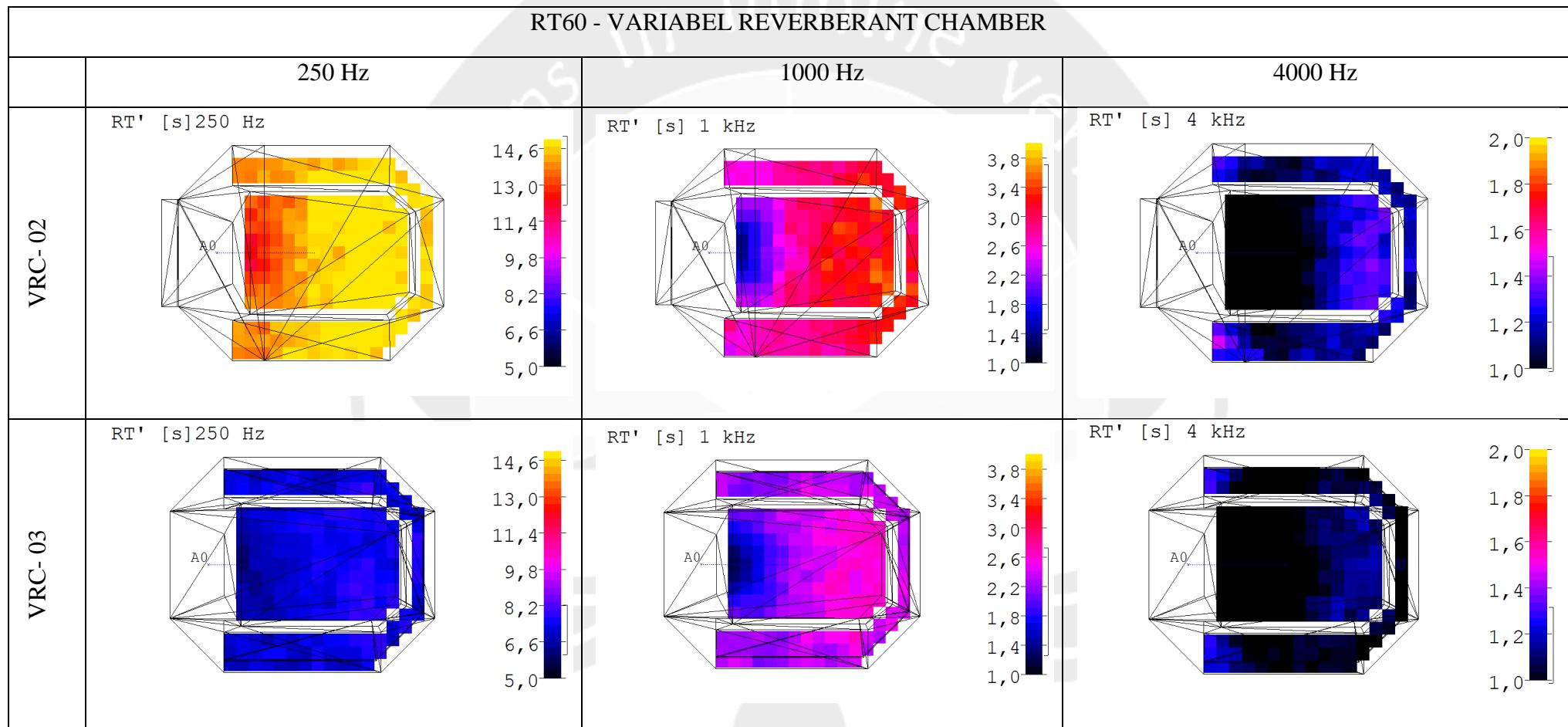
Lampiran 1 (lanjutan): Mapping nilai RT<sub>60</sub> pada variasi model variabel volume



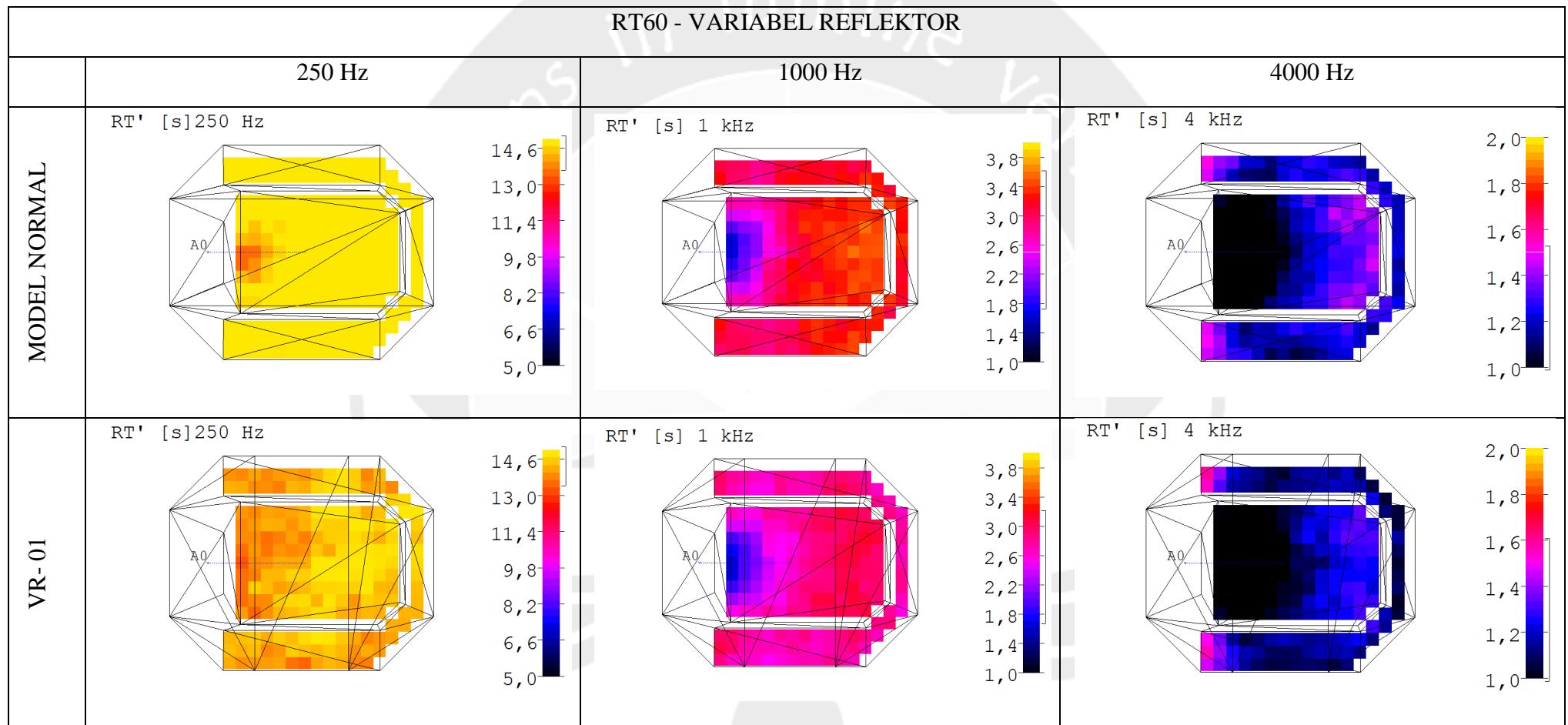
Lampiran 2: Mapping nilai RT pada variasi model reverberant chamber



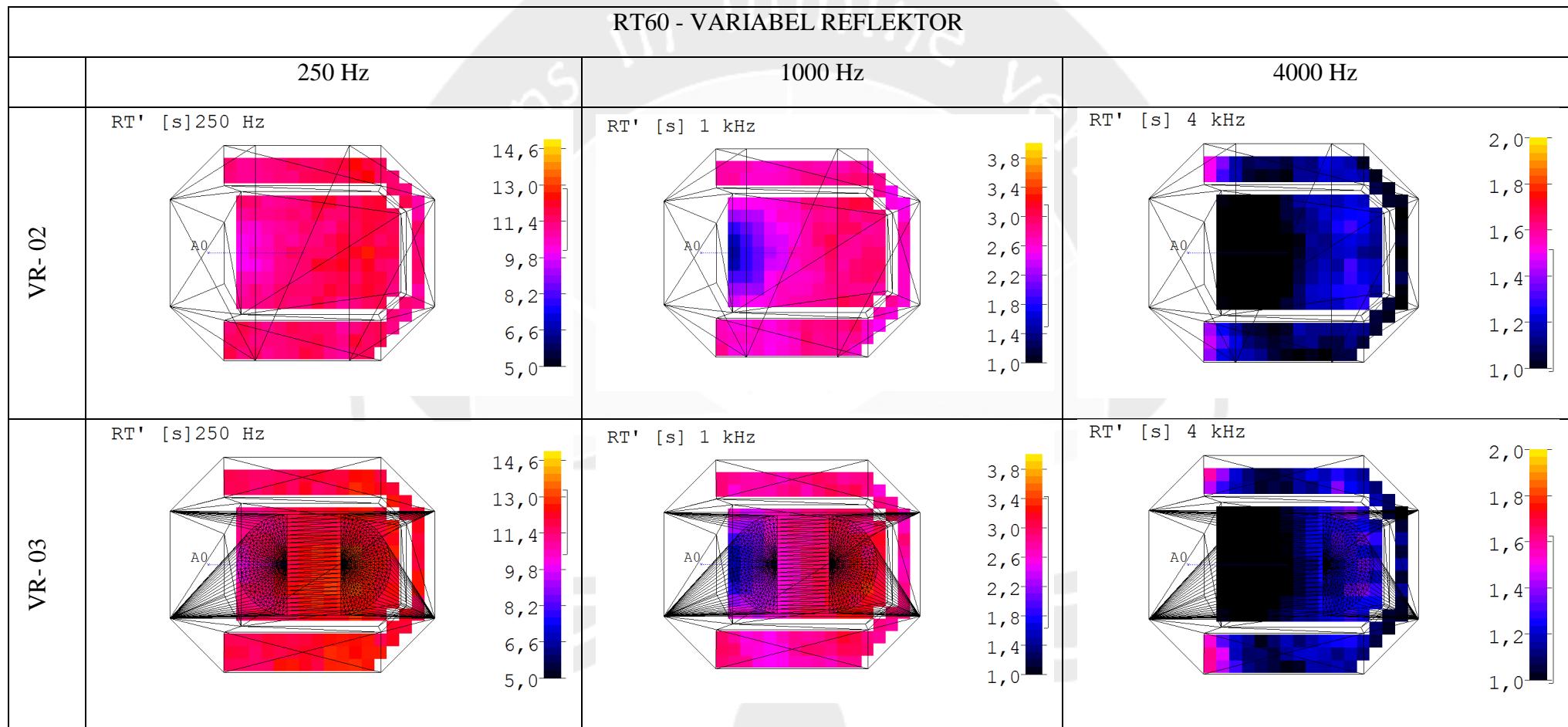
Lampiran 2 (lanjutan): Mapping nilai RT pada variasi model reverberant chamber



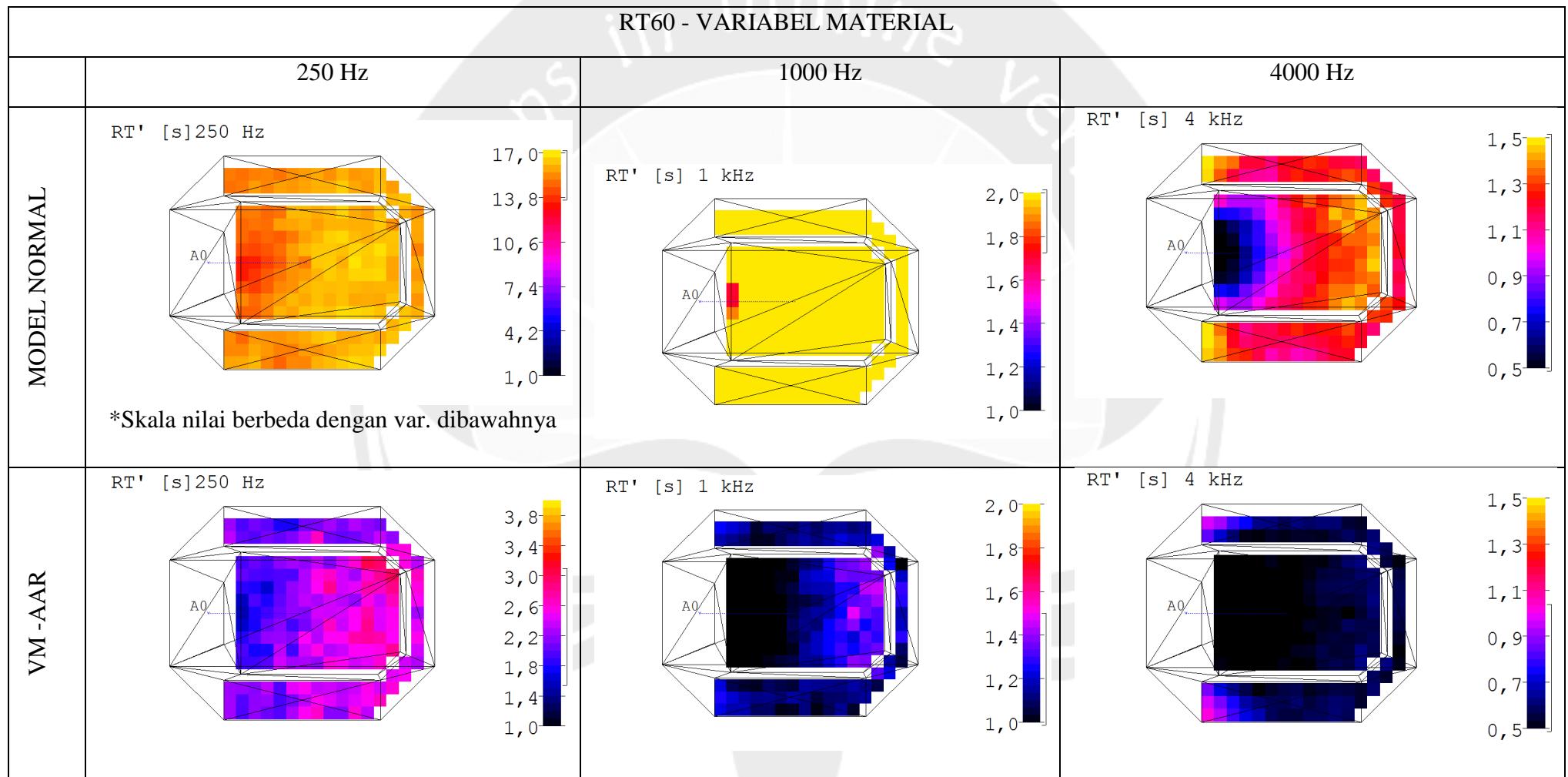
Lampiran 3: Mapping nilai RT pada variasi model variabel reflektor



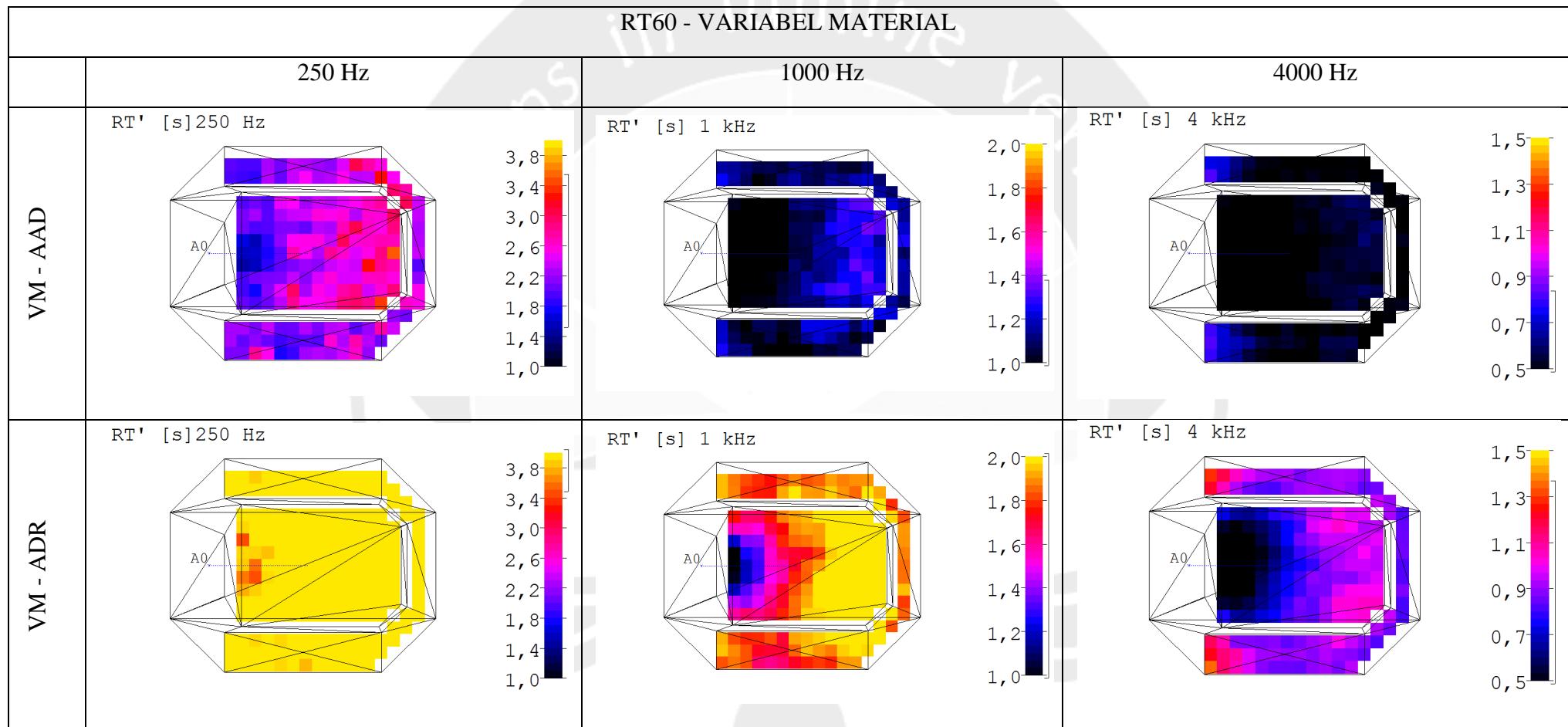
Lampiran 3 (lanjutan): Mapping nilai RT pada variasi model variabel reflektor



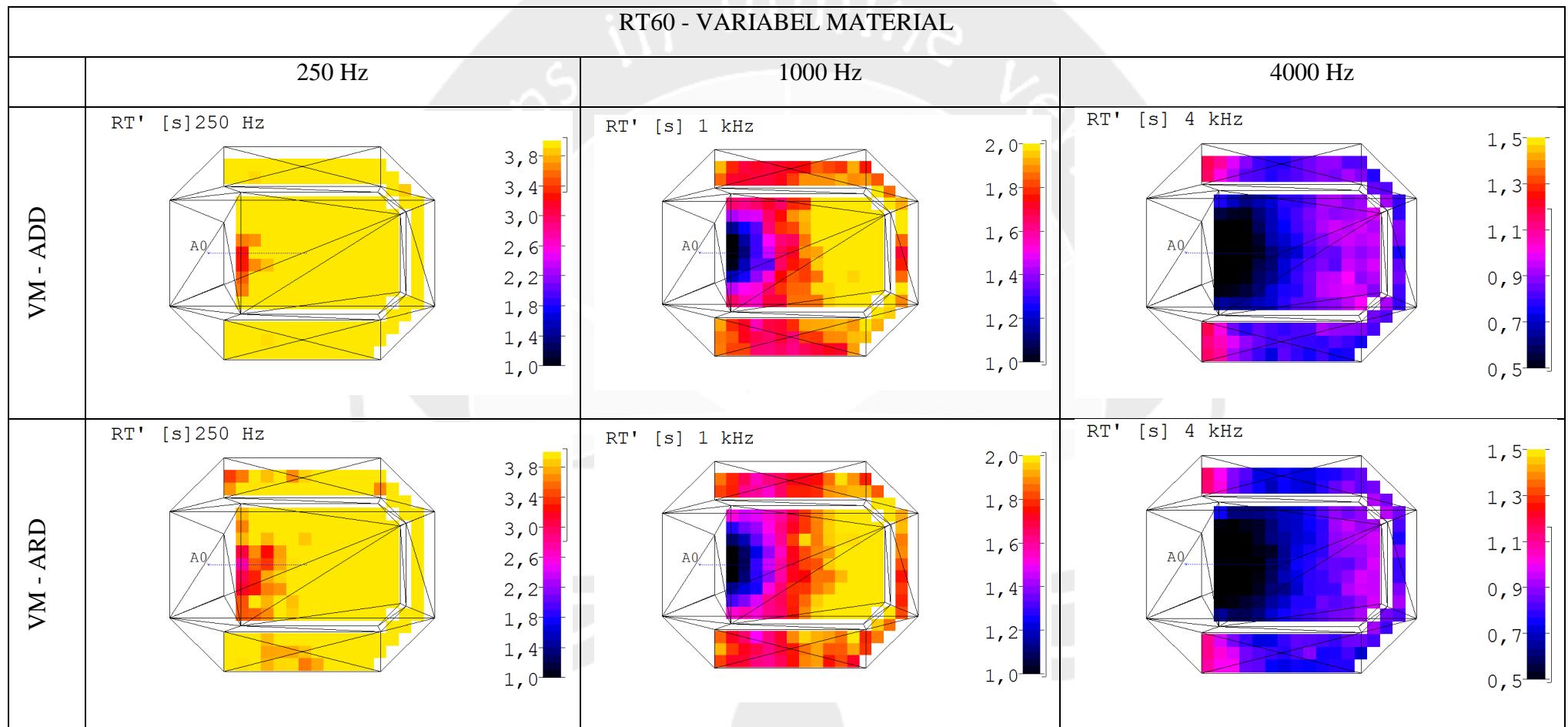
Lampiran 4: Mapping nilai RT pada variasi model variabel material



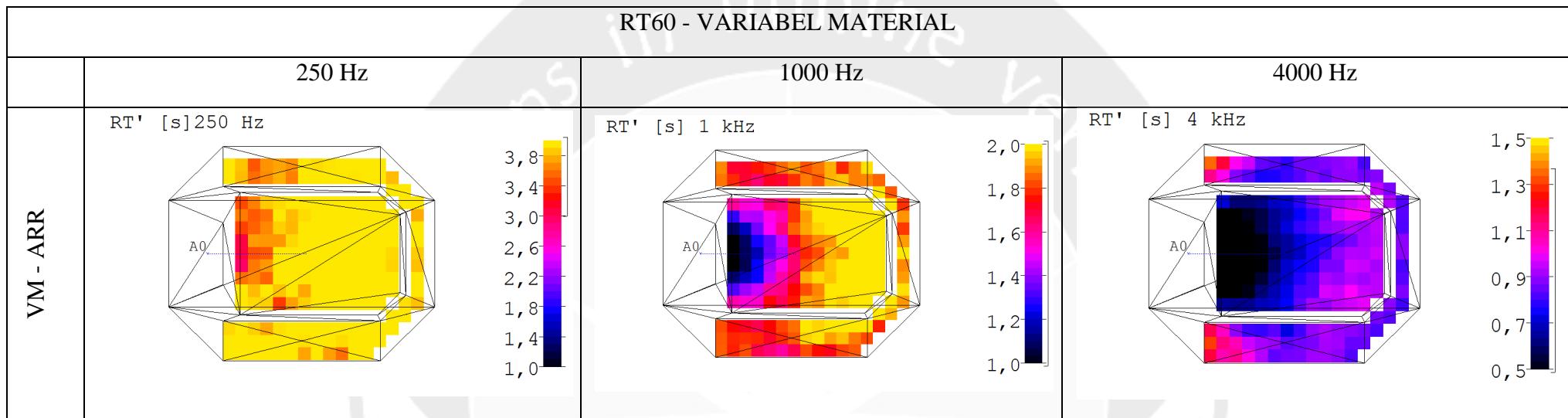
Lampiran 4 (lanjutan): Mapping nilai RT pada variasi model variabel material



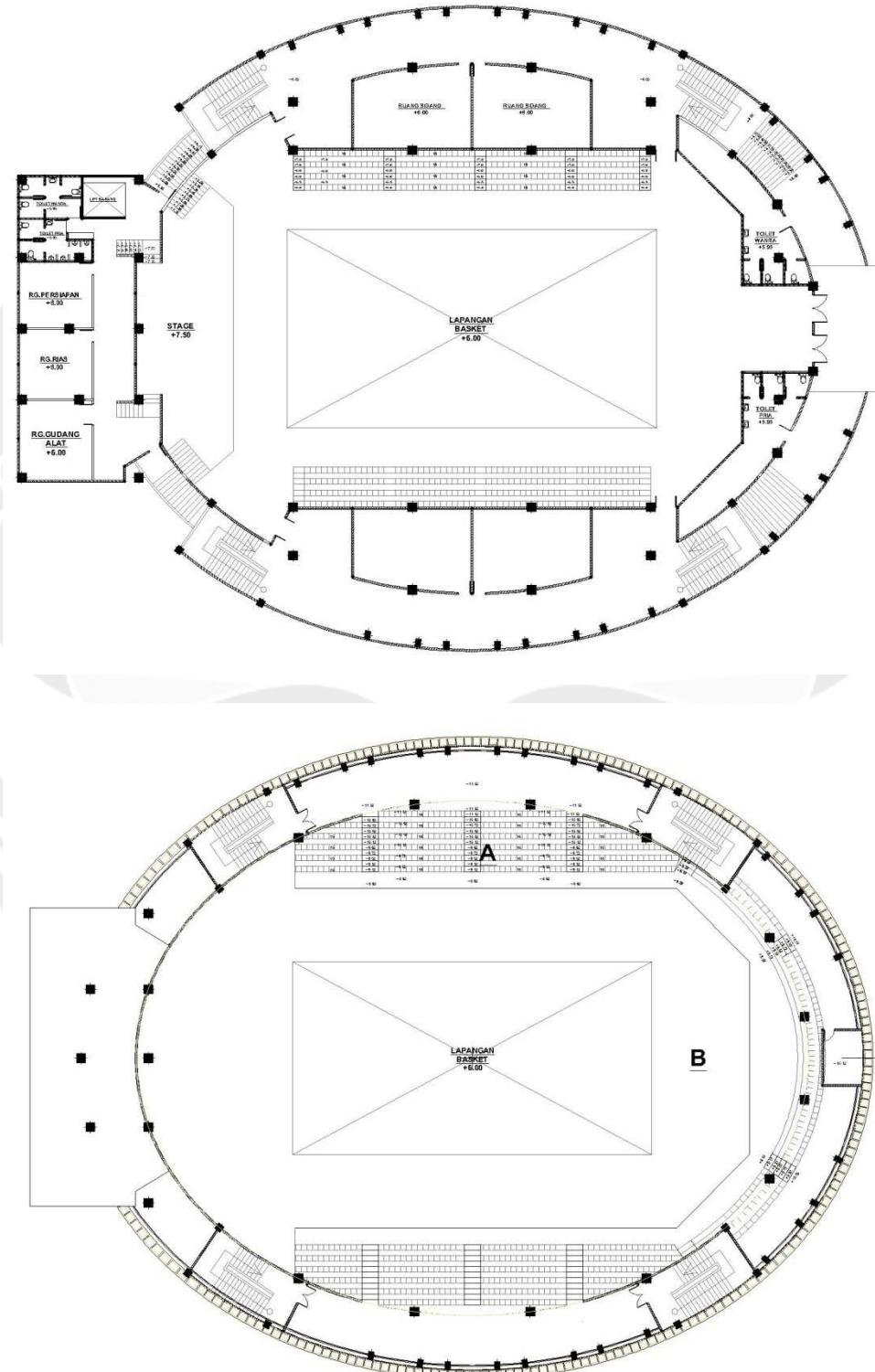
Lampiran 4 (lanjutan): Mapping nilai RT pada variasi model variabel material



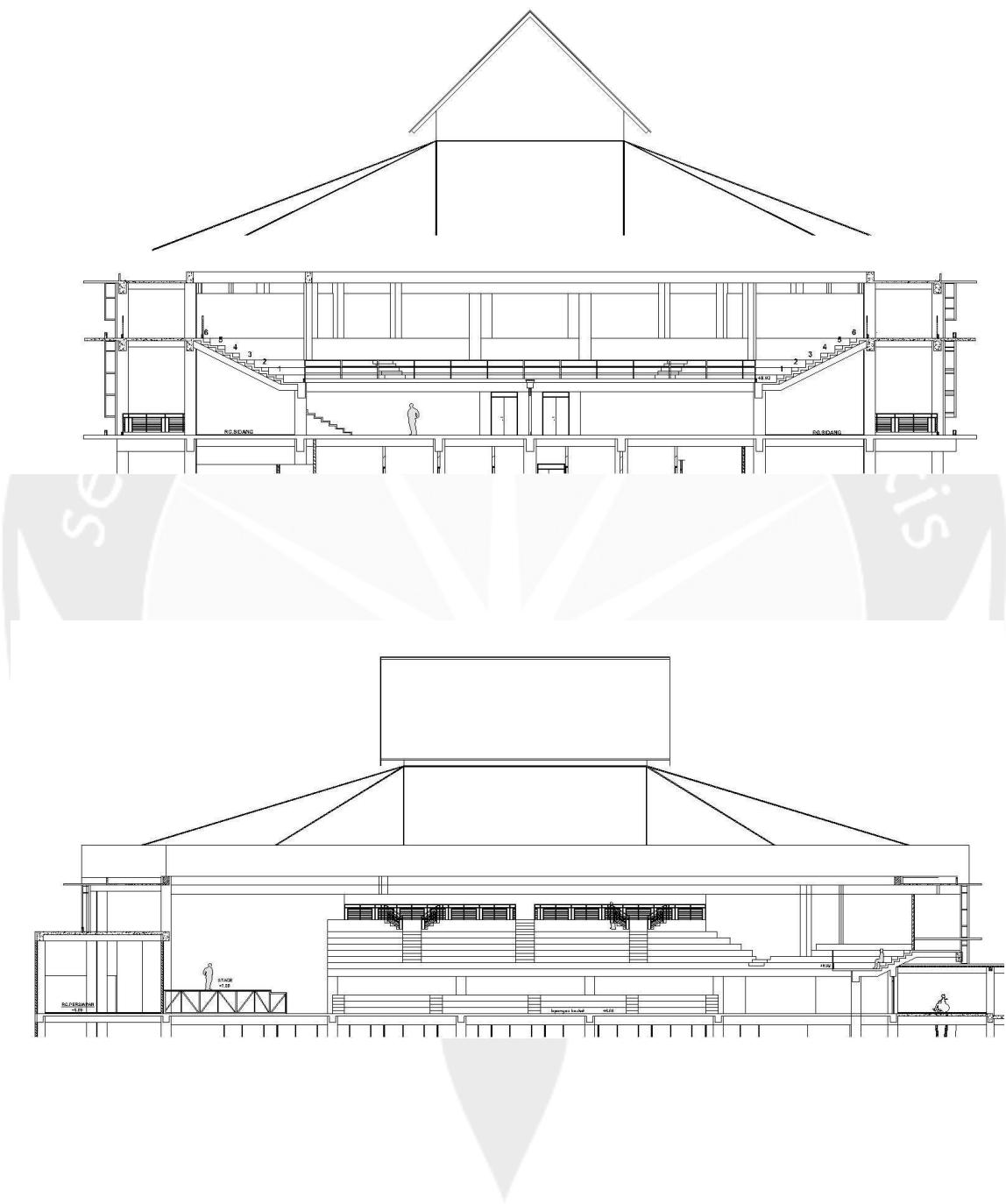
Lampiran 4 (lanjutan): Mapping nilai RT pada variasi model variabel material



Lampiran 5: Gambar desain Student Center UAJY update 18 November 2014 (atas: denah lapangan, bawah: denah tribun) (tim perencana, 2014).



Lampiran 5 (lanjutan): Gambar desain Student Center UAJY update 18 November 2014  
(atas: potongan melintang, bawah: potongan memanjang) (tim perencana, 2014).



Lampiran 6: Spesifikasi speaker yang digunakan pada simulasi objek studi

## Specifications:

|  |   |
|--|---|
| Frequency Response (+/-3 dB):  | 43 Hz - 18 kHz  |
| Frequency Range (-10 dB):  | 34 Hz - 20 kHz  |
| Coverage Pattern:  | 60° x 40° rotatable waveguide   |
| Directivity Factor (Q):  | 15.85   |
| Directivity Index (DI):  | 12 dB   |
| Maximum Peak Output <sup>1</sup> :                                       | 138 dB SPL 1m   |
| Transducer Section:  |   |
| Low Frequency Section:   | JBL 2265G, 381 mm (15 in) dia., 76 mm (3 in) Dual Coil neodymium Differential Drive*, Direct Cooled |
| Bandpass Nominal Impedance:  | 4 ohms  |
| Mid/High Frequency Section:  |   |
| Mid Frequency:   | JBL CMCD-82H, 200 mm (8 in) Dual Coil Differential Drive <sup>a</sup> transducer                    |
| High Frequency:  | JBL2452H-SL, 100mm (4 in) titanium damped diaphragm, 1.5 in. exit.                                  |
| Waveguide:   | JBL PT-K64-MHF  |
| Bandpass Nominal Impedance:  | 8 ohms  |
| System:  |   |
| DP2 Internal Amplification Output<br>(at nominal load):                  | 2200 Watts Peak, 1100 Watts Continuous  |
| DP2 Output (Continuous IEC shaped pink noise into rated load impedance): | 750LF/350HF Watts   |
| DP2 Output Section:  | 2-Channel, Class I  |
| Audio Input connector:   | XLR with loop-through   |
| Network control connector:   | Ethernet, RJ45 (DPAN, DPCN options)   |
| Signal Processing:   | DSP based, resident in Input Module. See page 2 For input module specifications.                    |
| System Management:   | DSP based limiters for mechanical and thermal protection  |
| AC Power Operating Range:  | Auto Select 90-132VAC/216-264VAC, 50/60 Hz  |
| AC Line Voltage:   | 50/60 Hz, Auto-Detect; 120V/240V (-15%, +10%)   |
| AC Input Connector:  | Neutrik PowerCon  |
| AC Loop-thru:  | Neutrik PowerCon  |
| AC Current Requirement:  | 6A per system at 120V, 3A per system at 240V  |
| Enclosure:   |   |
| Box Construction:  | 5/8 in. multi-ply exterior grade Baltic birch. Internally braced. Black DuraFlex™ finish.           |
| Suspension System:   | 6 standard air-cargo 3 in. track and 12 M10 fittings.   |
| Grille:  | 14 Gauge Black powder-coated perforated steel with foam backing.                                    |
| Dimensions (H x W x D):  | 914.4 x 528.3 x 624.8 mm<br>36 x 20.8 x 24.6 in.  |
| Net Weight:  | 44 kg (97 lbs.)   |

<sup>1</sup>Measured with IEC shaped noise in free field conditions.

## Lampiran 6 (lanjutan): Spesifikasi speaker yang digunakan pada simulasi objek studi

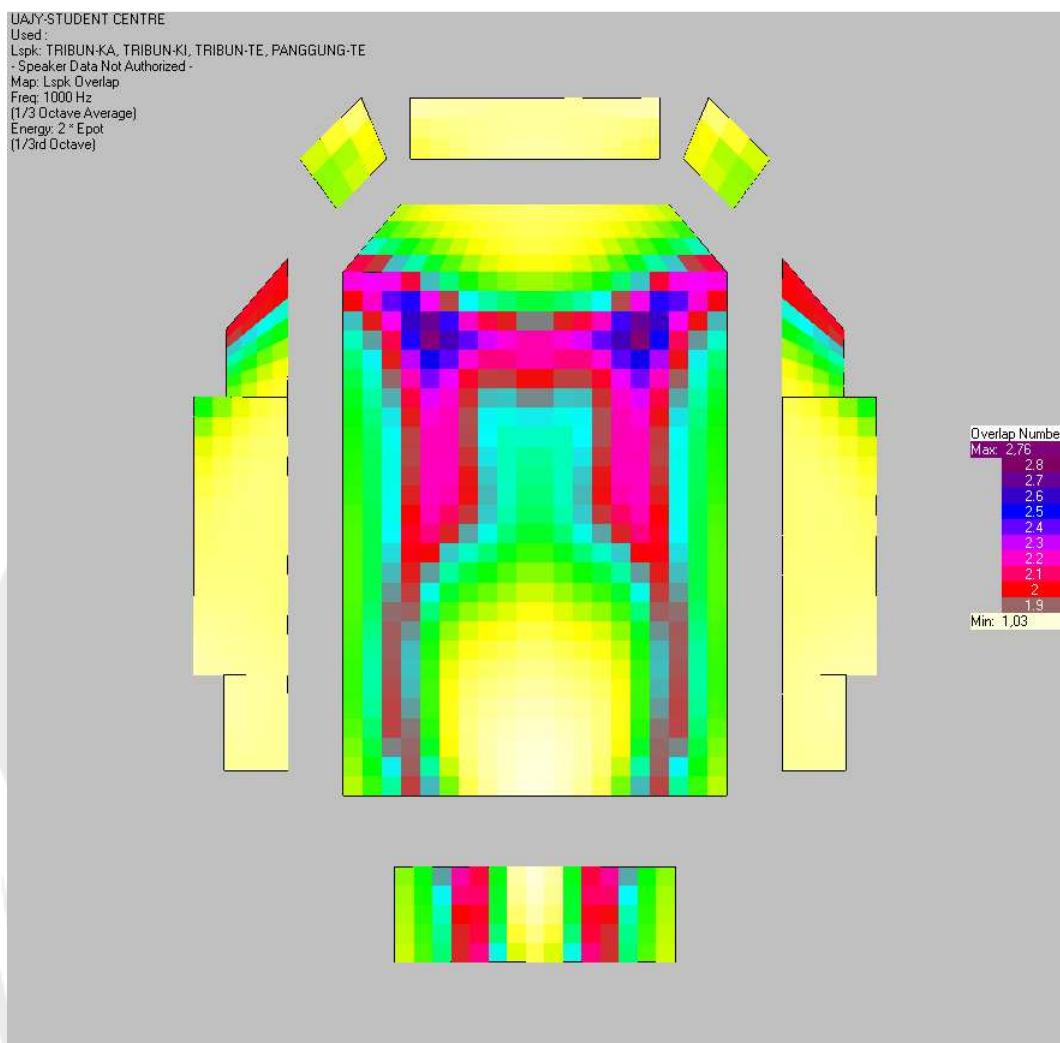
### Features

| Description                           | DPIP<br>(standard input module)<br>input module) | DPAN<br>(optional HiQnet network<br>input module) | DPCN<br>(optional HiQnet network<br>input module; digital audio) |
|---------------------------------------|--|---|--|
| HiQNet Compliant                      | No   | Yes   | Yes  |
| Network Communication                 | No   | 100MB Ethernet                                    | 100MB Ethernet   |
| Network Connections                   | N/A  | RJ-45, CAT5                                       | RJ-45, CAT5  |
| Audio signal format                   | Analog   | Analog  | Digital with analog backup                                       |
| CobraNet™ digital audio over ethernet | No   | No  | Yes  |
| Level Controls                        | Attenuator, 16dB range                           | Network Controllable                              | Network Controllable   |
| Remote Load Monitoring                | No   | Yes   | Yes  |
| User Assignable Filters               | No   | 16  | 16   |
| User Accessible Delays                | No   | Yes   | Yes  |
| Noise Generator                       | No   | Pink, White                                       | Pink, White  |
| Sine Wave Generator                   | No   | Continuous, Burst                                 | Continuous, Burst  |
| User Assignable Filter Types          | None   | 9   | 9  |
| Error Reporting                       | No   | Yes, via software                                 | Yes, via software  |
| Digital Speaker Setting Presets       | 2, fixed   | 10, user assignable                               | 10, user assignable  |
| Polarity Reverse                      | No   | Yes, via software                                 | Yes, via software  |
| Listen Bus line level remote monitor  | No   | No  | Yes  |
| Firmware upgrades via network         | No   | Yes   | Yes  |
| Mute                                  | No   | Remote via network                                | Remote via Network   |

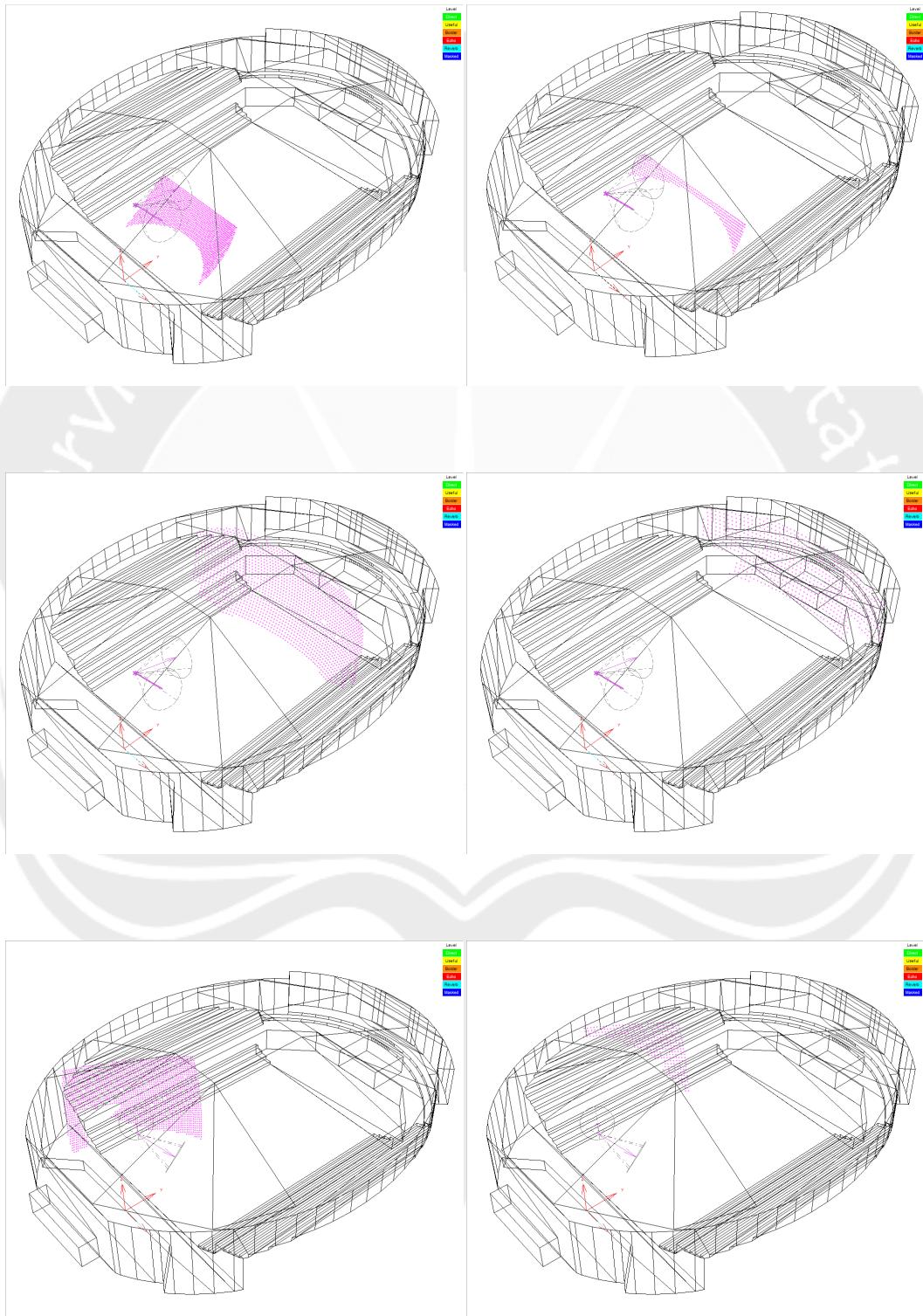
### Specifications

|                                |  |   |  |
|--------------------------------|--|---|--|
| Analog Audio Input Connectors  | XLR, female  | XLR, female   | XLR, female  |
| Input Type                     | Electronically Balanced, RF Filtered                                     |   |  |
| Signal Loop-through            | XLR, male, passive pass-through  |   |  |
| Input Impedance                | 20K Ohms Bal   | 20K Ohms Bal  | 20K Ohms Bal   |
| Polarity                       | (+) voltage on XLR pin 2 yields (+) LF pressure                          |   |  |
| Input Sensitivity at 1m        | 0 dBu: 122 dB spl<br>0 dBV: 120 dB spl<br>(Input attenuator set at 0 dB) | 0 dBu: 122 dB spl<br>0 dBV: 120 dB spl<br>(Internal sensitivity set to +4 dBu)  | 0 dBu: 122 dB spl<br>0 dBV: 120 dB spl<br>(Internal sensitivity set to +4 dBu)                     |
| Max Input Level                | +23 dBu  |   |  |
| Frequency Response             | 20 Hz – 20K Hz ± 0.5 dB  |   |  |
| DSP Processing                 | dbx Type IV analog-to-digital conversion circuitry                       | 24 Bit conversion, 32 bit floating point processing                             | 24 Bit conversion, 32 bit floating point processing  |
| Dynamic Range (20-20 KHz)      | > 107 dB (A Weighted)  | > 110 dB (A Weighted)   | > 110 dB (A Weighted)  |
| THD+N (20-20 KHz), rated power | < 0.5%   |   |  |
| Crosstalk                      | > 60 dB @ 1kHz   |   |  |
| User Programmable Signal Delay | N/A  | 2 seconds   | 2 seconds  |
| Front Panel Controls           | Gain, Sub Filter Enable  | Enable ALT Preset   | Enable ALT Preset  |
| Front Panel Indicators         | Signal/clip, ready, thermal, fault, sub filter on/off                    | Signal/clip, ready, thermal, fault, alt. preset select, Network: activity, link | Signal/clip, ready, thermal, fault, alt. preset select, Network: acivity, link, CobraNet conductor |

Lampiran 7: Overlaping bunyi dari speaker pada area audien



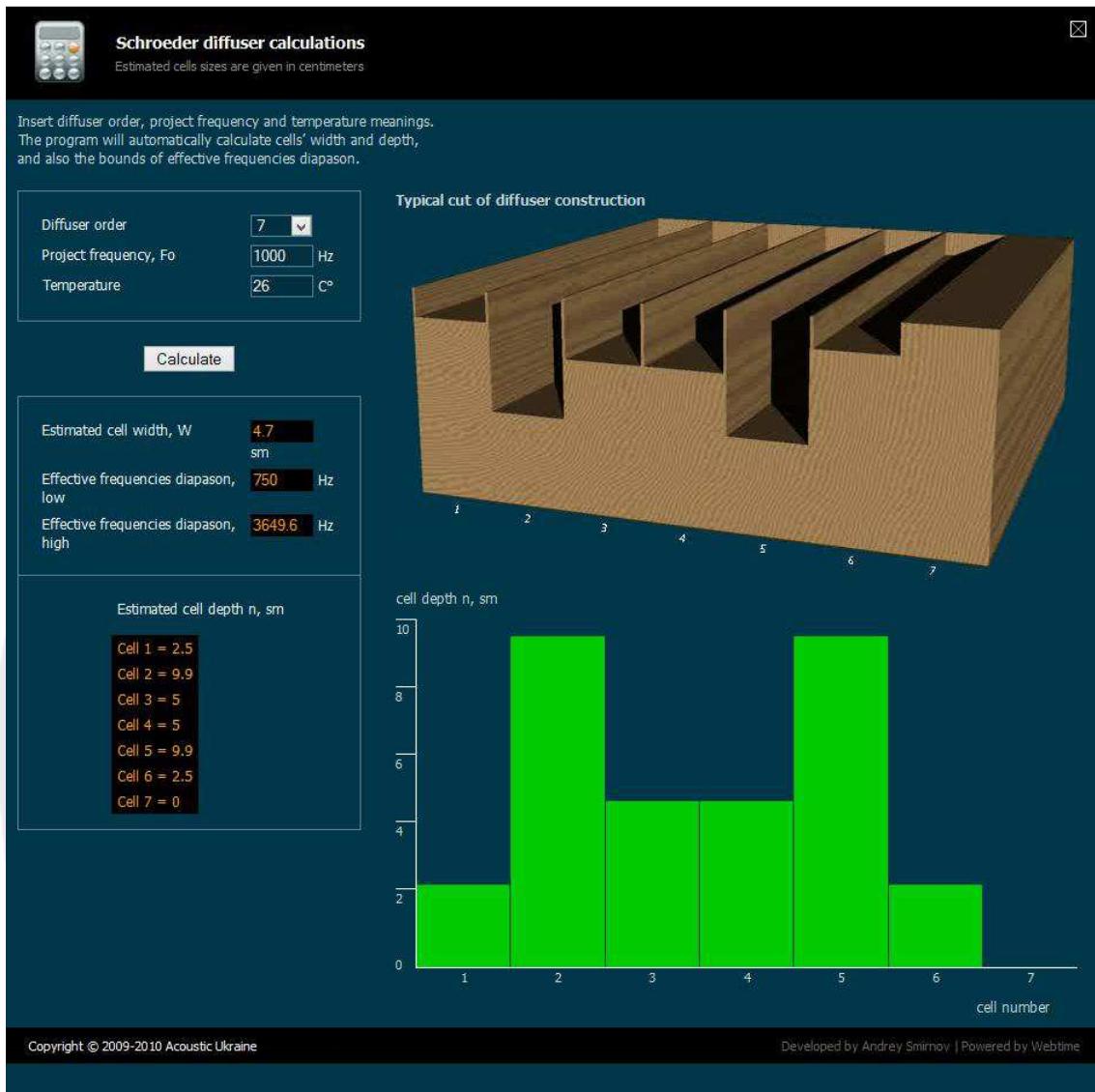
Lampiran 8: Simulasi partikel bunyi dari sumber suara untuk penentuan posisi dan kemiringan speaker (atas: speaker A1, tengah: speaker A2, bawah: speaker A3 & A4)



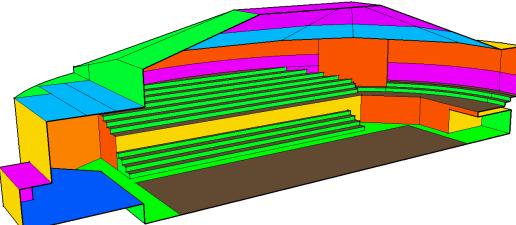
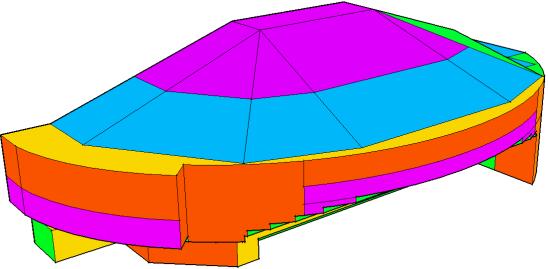
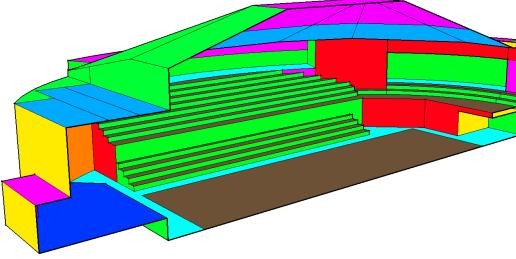
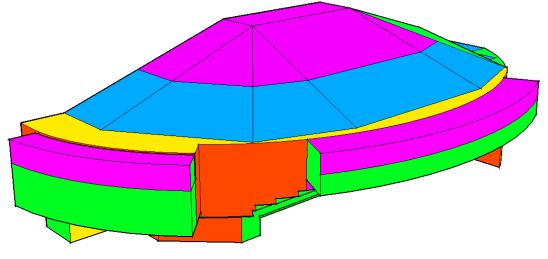
Lampiran 9: Jenis material yang digunakan dan nilai koefisien serapnya

| NO | NAMA MATERIAL<br>(layer) | KOEFISIEN<br>SERAP<br>(125 250 500 1K<br>2K 4K) | KOEFISIEN<br>SCATTERING<br>(125 250 500 1K<br>2K 4K) | KETERANGAN  |
|----|--------------------------|---|--|---|
| 1  | AUDIEN                   | 46 49 60 69 73 69                               |  | Jemaat duduk di bangku kayu   |
| 2  | BASSTRAP                 | 95 35 18 20 27 45                               |  | RPG Bass trap spesifikasi terlampir   |
| 3  | DDG_DIFF                 | 10 10 10 10 10 10                               | 80 80 80 80 80 80                                    | Schroeder Diffuser tipe untuk frekuensi bawah, menengah, atas. Spesifikasi terlampir  |
| 4  | DDG_DIFF_PG              | 10 10 10 10 10 10                               | 80 80 80 80 80 80                                    | Schroeder Diffuser tipe untuk frekuensi bawah, menengah, atas. Spesifikasi terlampir  |
| 5  | DDG_REFL                 | 11 8 7 9 6 5                                    |  | Partisi pasangan papan kayu atau hardboard  |
| 6  | DDG_REFL_PG              | 11 8 7 9 6 5                                    |  | Partisi pasangan papan kayu atau hardboard  |
| 7  | JAYABELL                 | 52 51 48 42 43 36                               |  | Jayabell tipe R12 no.2 dengan plenum diisi rock wool tebal 1 inch berat 80kg/m3   |
| 8  | LANTAI_LAP               | 4 4 7 6 6 7                                     |  | Parquet vinil kayu diatas konstruksi beton  |
| 9  | PERF_MTL_04              | 8 34 76 98 76 30                                |  | Panel perforated metal diameter lubang 12mm jarak pusat lubang 20mm tebal 1mm, Rockwool 80kg/m3 2 inchi dengan cavity 2cm, Rockwool disisi belakang (Urutan depan-belakang: Perf. Metal-Cavity-Rockwool-Papan/Hardboard)      |
| 10 | PERF_MTL_05              | 64 76 50 30 8 4                                 |  | Panel perforated metal diameter lubang 2mm jarak pusat lubang 20mm tebal 1mm, Rockwool 80kg/m3 tebal 1 inchi dengan cavity 17.5cm, Rockwool disisi depan (Urutan depan-belakang: Perf. Metal-Rockwool-Cavity-Papan/Hardboard) |
| 11 | PLF_DIFF_MRG             | 15 10 5 4 7 9                                   | 80 80 80 80 80 80                                    | Schroeder Diffuser tipe untuk frekuensi bawah, menengah, atas. Spesifikasi terlampir  |
| 12 | PLF_DIFF_TENGAH          | 10 10 10 10 10 10                               | 10 50 50 50 50 10                                    | QRD diffuser.   |
| 13 | PLF_REFL_PG              | 15 10 5 4 7 9                                   |  | Gypsum 1/2 inchi digantung di rangka metal  |
| 14 | PLF_REF_MRG_DPN          | 15 10 5 4 7 9                                   |  | Gypsum 1/2 inchi digantung di rangka metal  |
| 15 | STAGE                    | 54 78 86 86 96 96                               |  | Karpet tebal diatas konstruksi papan kayu   |
| 16 | UPTRADE_ATS              | 12 9 7 5 5 4                                    |  | Beton diplester finish cat  |
| 17 | UPTRADE_BWH              | 11 8 7 9 6 5                                    |  | Partisi atau pasangan papan kayu atau hardboard   |

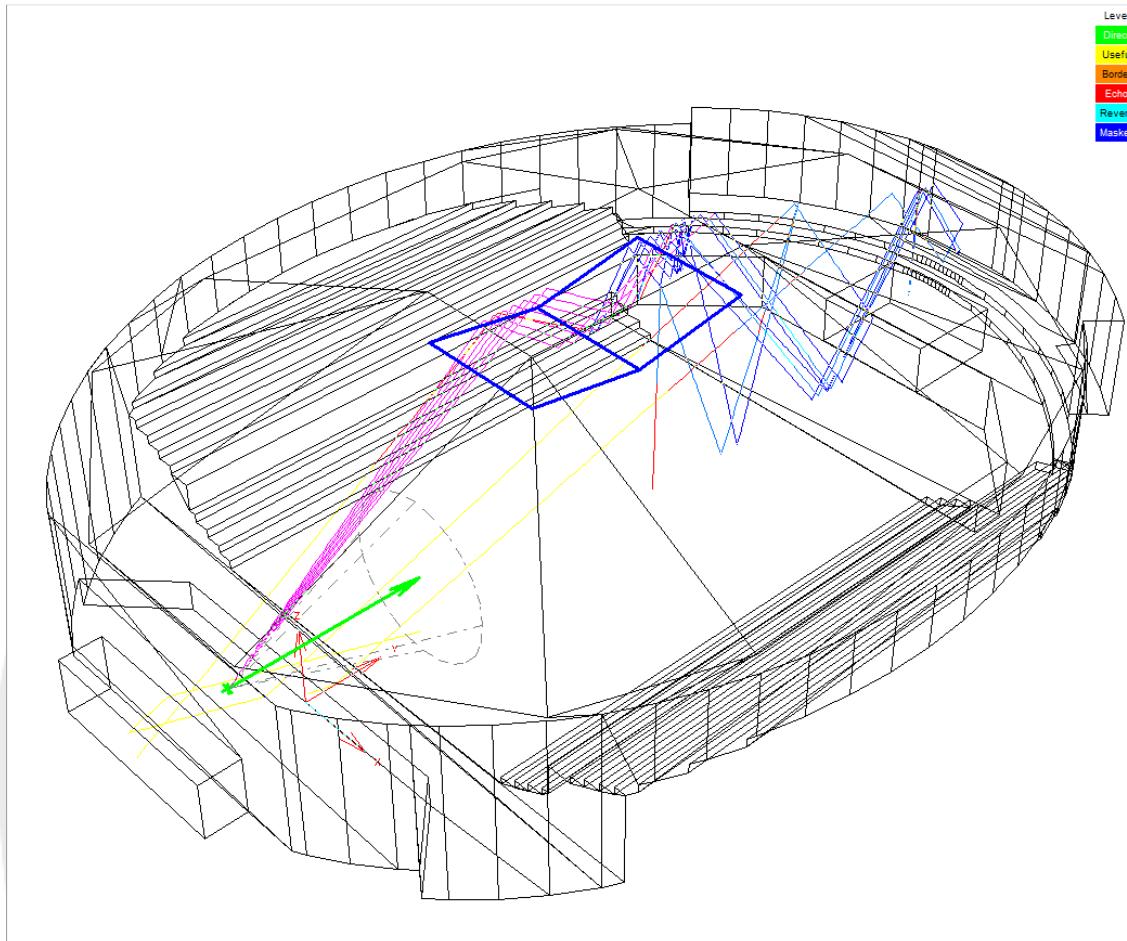
## Lampiran 10: Hasil perhitungan dan desain model diffuser



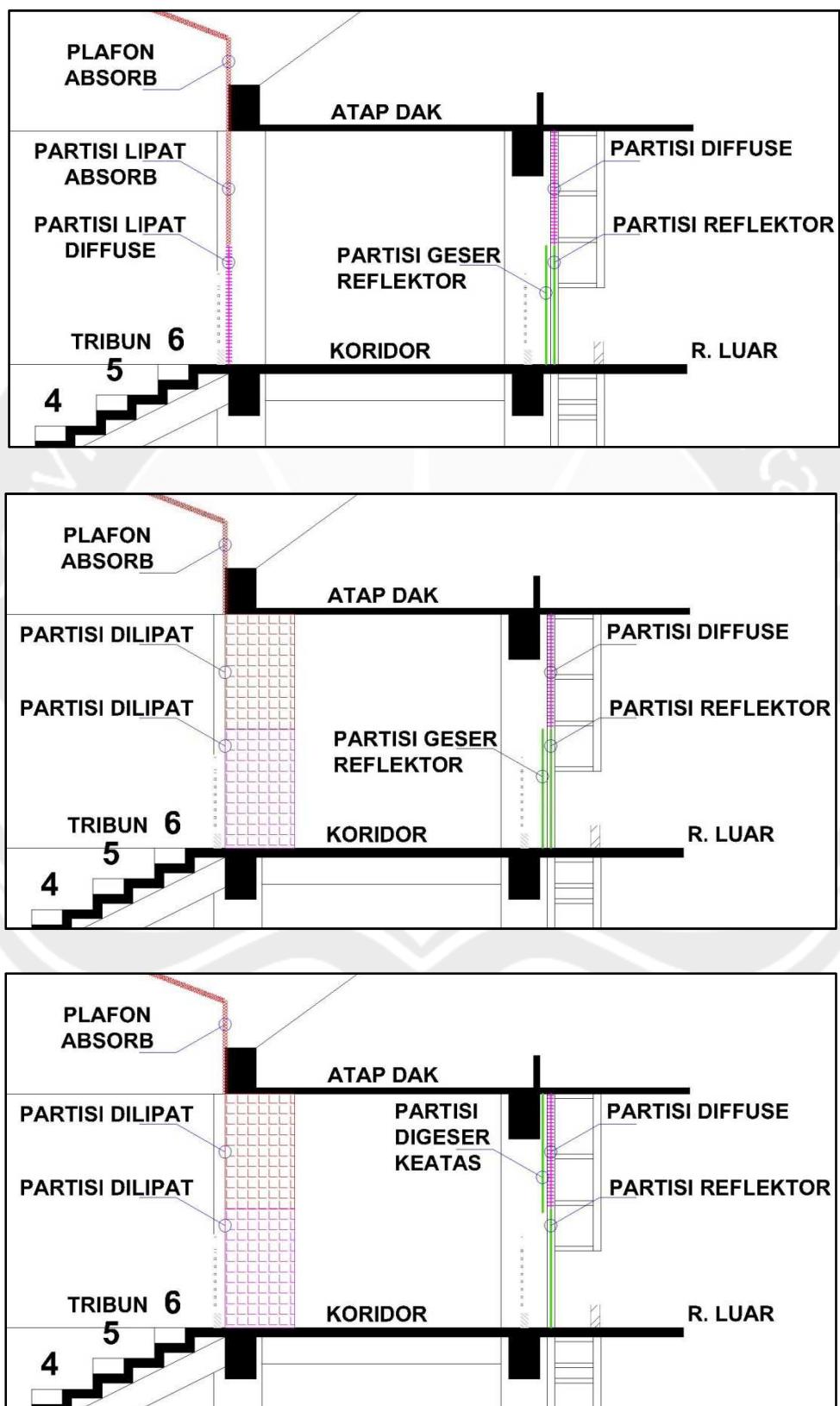
Lampiran 11: Model objek studi hasil kombinasi konsep variabel fisik yang akan diuji

|   |  | POTONGAN  |  |          |                                     |               |                                     |            |                                     |                |                                     |            |                                     |                   |                                     |               |                                     |               |                                     |            |                                     |                   |                                     |               |                                     |         |                                     |            |                                     |               |                                     |              |                                     |               |                                     |               |                                     |  |  |
|---|--|---|--|----------|-------------------------------------|---------------|-------------------------------------|------------|-------------------------------------|----------------|-------------------------------------|------------|-------------------------------------|-------------------|-------------------------------------|---------------|-------------------------------------|---------------|-------------------------------------|------------|-------------------------------------|-------------------|-------------------------------------|---------------|-------------------------------------|---------|-------------------------------------|------------|-------------------------------------|---------------|-------------------------------------|--------------|-------------------------------------|---------------|-------------------------------------|---------------|-------------------------------------|--|--|
| MODEL PIDATO  | MODEL MUSIK PROGRESIF  | MODEL MUSIK PANJANG   |  |          |                                     |               |                                     |            |                                     |                |                                     |            |                                     |                   |                                     |               |                                     |               |                                     |            |                                     |                   |                                     |               |                                     |         |                                     |            |                                     |               |                                     |              |                                     |               |                                     |               |                                     |  |  |
|  |    |  |  |          |                                     |               |                                     |            |                                     |                |                                     |            |                                     |                   |                                     |               |                                     |               |                                     |            |                                     |                   |                                     |               |                                     |         |                                     |            |                                     |               |                                     |              |                                     |               |                                     |               |                                     |  |  |
| KODE WARNA DAN NAMA MATERIAL  | <table border="1"> <tbody> <tr> <td>○ AUDIEN</td><td><input checked="" type="checkbox"/></td><td>○ PERF_MTL_05</td><td><input checked="" type="checkbox"/></td></tr> <tr> <td>○ BASSTRAP</td><td><input checked="" type="checkbox"/></td><td>○ PLF_DIFF_MRG</td><td><input checked="" type="checkbox"/></td></tr> <tr> <td>○ DDG_DIFF</td><td><input checked="" type="checkbox"/></td><td>○ PLF_DIFF_TENGAH</td><td><input checked="" type="checkbox"/></td></tr> <tr> <td>○ DDG_DIFF_PG</td><td><input checked="" type="checkbox"/></td><td>○ PLF_REFL_PG</td><td><input checked="" type="checkbox"/></td></tr> <tr> <td>○ DDG_REFL</td><td><input checked="" type="checkbox"/></td><td>○ PLF_REF_MRG_DPN</td><td><input checked="" type="checkbox"/></td></tr> <tr> <td>○ DDG_REFL_PG</td><td><input checked="" type="checkbox"/></td><td>○ STAGE</td><td><input checked="" type="checkbox"/></td></tr> <tr> <td>○ JAYABELL</td><td><input checked="" type="checkbox"/></td><td>○ UPTRADE_ATS</td><td><input checked="" type="checkbox"/></td></tr> <tr> <td>○ LANTAI-LAP</td><td><input checked="" type="checkbox"/></td><td>○ UPTRADE_BWH</td><td><input checked="" type="checkbox"/></td></tr> <tr> <td>○ PERF_MTL_04</td><td><input checked="" type="checkbox"/></td><td></td><td></td></tr> </tbody> </table> |   |  | ○ AUDIEN | <input checked="" type="checkbox"/> | ○ PERF_MTL_05 | <input checked="" type="checkbox"/> | ○ BASSTRAP | <input checked="" type="checkbox"/> | ○ PLF_DIFF_MRG | <input checked="" type="checkbox"/> | ○ DDG_DIFF | <input checked="" type="checkbox"/> | ○ PLF_DIFF_TENGAH | <input checked="" type="checkbox"/> | ○ DDG_DIFF_PG | <input checked="" type="checkbox"/> | ○ PLF_REFL_PG | <input checked="" type="checkbox"/> | ○ DDG_REFL | <input checked="" type="checkbox"/> | ○ PLF_REF_MRG_DPN | <input checked="" type="checkbox"/> | ○ DDG_REFL_PG | <input checked="" type="checkbox"/> | ○ STAGE | <input checked="" type="checkbox"/> | ○ JAYABELL | <input checked="" type="checkbox"/> | ○ UPTRADE_ATS | <input checked="" type="checkbox"/> | ○ LANTAI-LAP | <input checked="" type="checkbox"/> | ○ UPTRADE_BWH | <input checked="" type="checkbox"/> | ○ PERF_MTL_04 | <input checked="" type="checkbox"/> |  |  |
| ○ AUDIEN  | <input checked="" type="checkbox"/>  | ○ PERF_MTL_05   | <input checked="" type="checkbox"/>  |          |                                     |               |                                     |            |                                     |                |                                     |            |                                     |                   |                                     |               |                                     |               |                                     |            |                                     |                   |                                     |               |                                     |         |                                     |            |                                     |               |                                     |              |                                     |               |                                     |               |                                     |  |  |
| ○ BASSTRAP  | <input checked="" type="checkbox"/>  | ○ PLF_DIFF_MRG  | <input checked="" type="checkbox"/>  |          |                                     |               |                                     |            |                                     |                |                                     |            |                                     |                   |                                     |               |                                     |               |                                     |            |                                     |                   |                                     |               |                                     |         |                                     |            |                                     |               |                                     |              |                                     |               |                                     |               |                                     |  |  |
| ○ DDG_DIFF  | <input checked="" type="checkbox"/>  | ○ PLF_DIFF_TENGAH   | <input checked="" type="checkbox"/>  |          |                                     |               |                                     |            |                                     |                |                                     |            |                                     |                   |                                     |               |                                     |               |                                     |            |                                     |                   |                                     |               |                                     |         |                                     |            |                                     |               |                                     |              |                                     |               |                                     |               |                                     |  |  |
| ○ DDG_DIFF_PG   | <input checked="" type="checkbox"/>  | ○ PLF_REFL_PG   | <input checked="" type="checkbox"/>  |          |                                     |               |                                     |            |                                     |                |                                     |            |                                     |                   |                                     |               |                                     |               |                                     |            |                                     |                   |                                     |               |                                     |         |                                     |            |                                     |               |                                     |              |                                     |               |                                     |               |                                     |  |  |
| ○ DDG_REFL  | <input checked="" type="checkbox"/>  | ○ PLF_REF_MRG_DPN   | <input checked="" type="checkbox"/>  |          |                                     |               |                                     |            |                                     |                |                                     |            |                                     |                   |                                     |               |                                     |               |                                     |            |                                     |                   |                                     |               |                                     |         |                                     |            |                                     |               |                                     |              |                                     |               |                                     |               |                                     |  |  |
| ○ DDG_REFL_PG   | <input checked="" type="checkbox"/>  | ○ STAGE   | <input checked="" type="checkbox"/>  |          |                                     |               |                                     |            |                                     |                |                                     |            |                                     |                   |                                     |               |                                     |               |                                     |            |                                     |                   |                                     |               |                                     |         |                                     |            |                                     |               |                                     |              |                                     |               |                                     |               |                                     |  |  |
| ○ JAYABELL  | <input checked="" type="checkbox"/>  | ○ UPTRADE_ATS   | <input checked="" type="checkbox"/>  |          |                                     |               |                                     |            |                                     |                |                                     |            |                                     |                   |                                     |               |                                     |               |                                     |            |                                     |                   |                                     |               |                                     |         |                                     |            |                                     |               |                                     |              |                                     |               |                                     |               |                                     |  |  |
| ○ LANTAI-LAP  | <input checked="" type="checkbox"/>  | ○ UPTRADE_BWH   | <input checked="" type="checkbox"/>  |          |                                     |               |                                     |            |                                     |                |                                     |            |                                     |                   |                                     |               |                                     |               |                                     |            |                                     |                   |                                     |               |                                     |         |                                     |            |                                     |               |                                     |              |                                     |               |                                     |               |                                     |  |  |
| ○ PERF_MTL_04   | <input checked="" type="checkbox"/>  |   |  |          |                                     |               |                                     |            |                                     |                |                                     |            |                                     |                   |                                     |               |                                     |               |                                     |            |                                     |                   |                                     |               |                                     |         |                                     |            |                                     |               |                                     |              |                                     |               |                                     |               |                                     |  |  |

Lampiran 12: Simulasi ray untuk menentukan desain reverberant chamber pada plafon

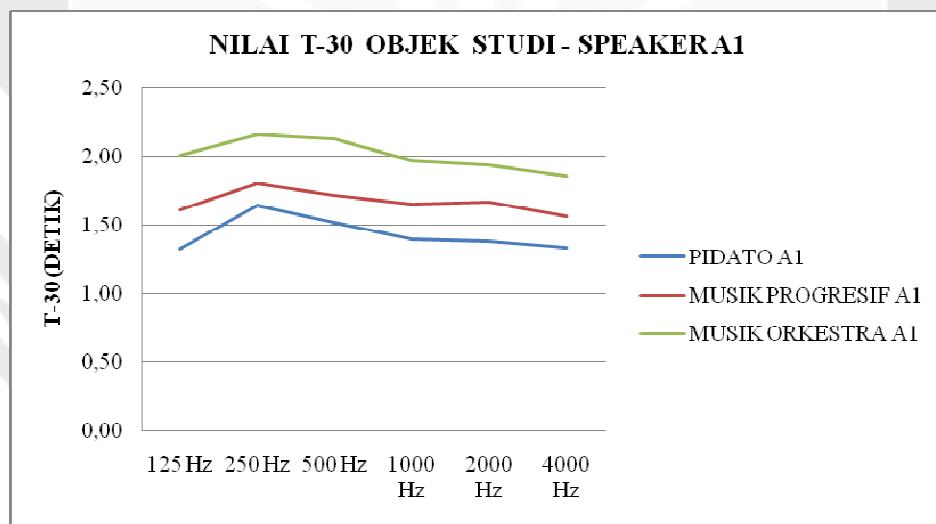


Lampiran 13: Konsep aplikasi teknis perubahan variabel material (atas: pidato, tengah: musik progresif, bawah: musik panjang)

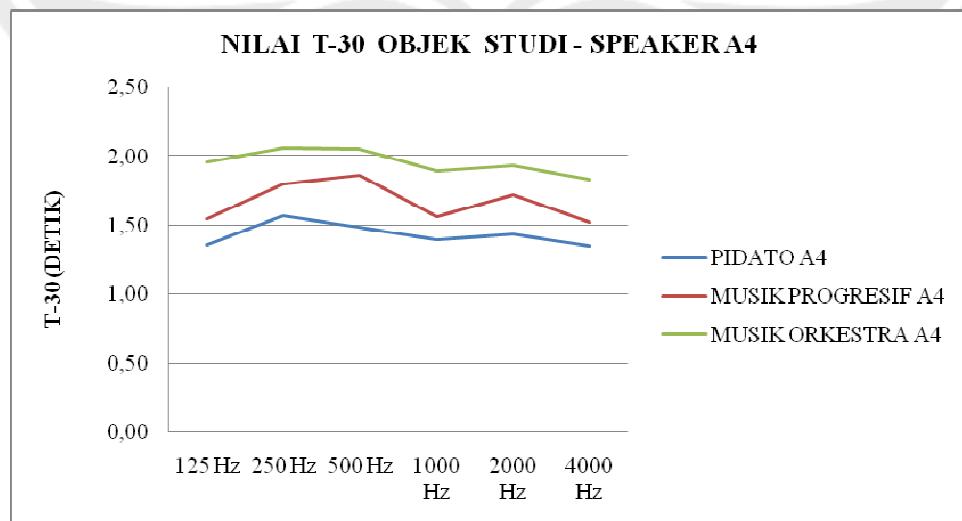
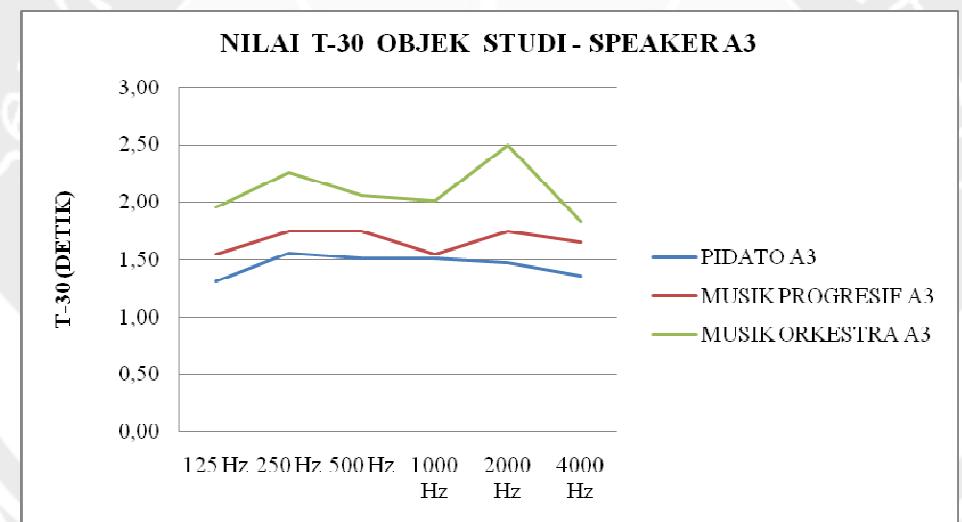
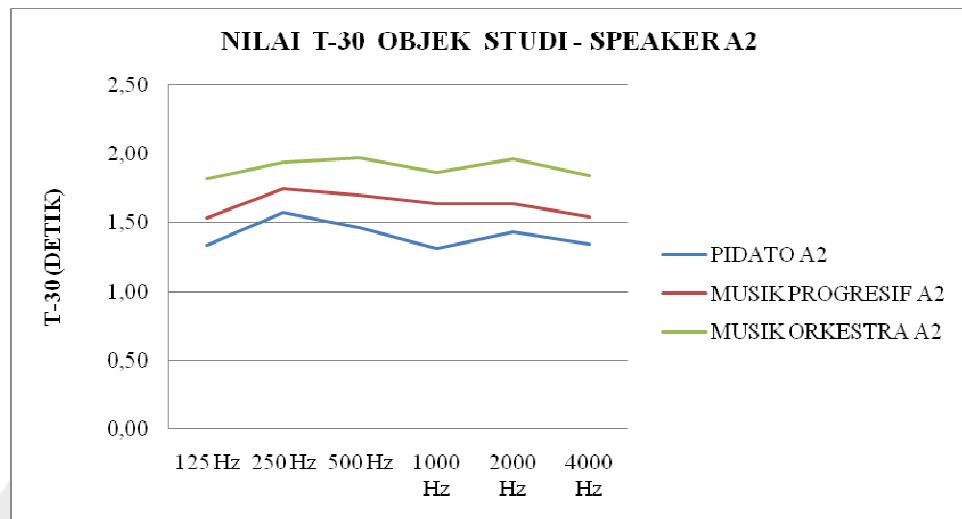


Lampiran 14: Komparasi nilai T-30 hasil simulasi pada objek studi

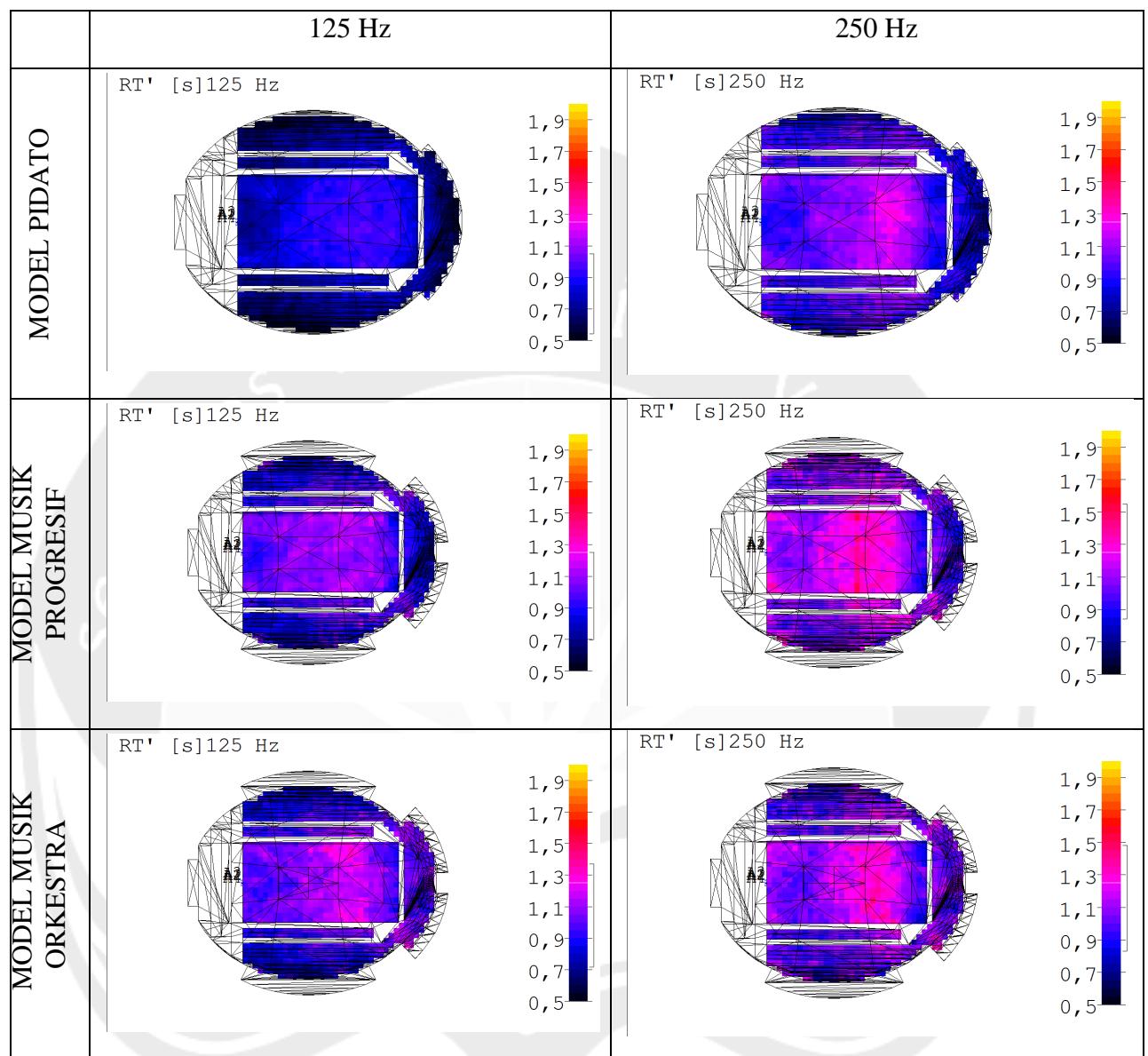
|                    | T-30 (detik) OBJEK STUDI |           |           |            |            |            |
|--------------------|--------------------------|-----------|-----------|------------|------------|------------|
|                    | 125<br>Hz                | 250<br>Hz | 500<br>Hz | 1000<br>Hz | 2000<br>Hz | 4000<br>Hz |
| PIDATO A1          | 1.32                     | 1.64      | 1.51      | 1.39       | 1.38       | 1.33       |
| PIDATO A2          | 1.33                     | 1.57      | 1.46      | 1.31       | 1.43       | 1.34       |
| PIDATO A3          | 1.31                     | 1.56      | 1.51      | 1.51       | 1.47       | 1.36       |
| PIDATO A4          | 1.36                     | 1.57      | 1.48      | 1.40       | 1.44       | 1.35       |
| MUSIK PROGRESIF A1 | 1.61                     | 1.80      | 1.71      | 1.65       | 1.66       | 1.56       |
| MUSIK PROGRESIF A2 | 1.53                     | 1.75      | 1.70      | 1.64       | 1.64       | 1.54       |
| MUSIK PROGRESIF A3 | 1.55                     | 1.75      | 1.75      | 1.55       | 1.75       | 1.65       |
| MUSIK PROGRESIF A4 | 1.54                     | 1.80      | 1.86      | 1.56       | 1.72       | 1.52       |
| MUSIK ORKESTRA A1  | 2.01                     | 2.16      | 2.13      | 1.97       | 1.94       | 1.86       |
| MUSIK ORKESTRA A2  | 1.82                     | 1.94      | 1.97      | 1.87       | 1.96       | 1.84       |
| MUSIK ORKESTRA A3  | 1.95                     | 2.25      | 2.06      | 2.01       | 2.49       | 1.83       |
| MUSIK ORKESTRA A4  | 1.96                     | 2.06      | 2.05      | 1.89       | 1.93       | 1.83       |



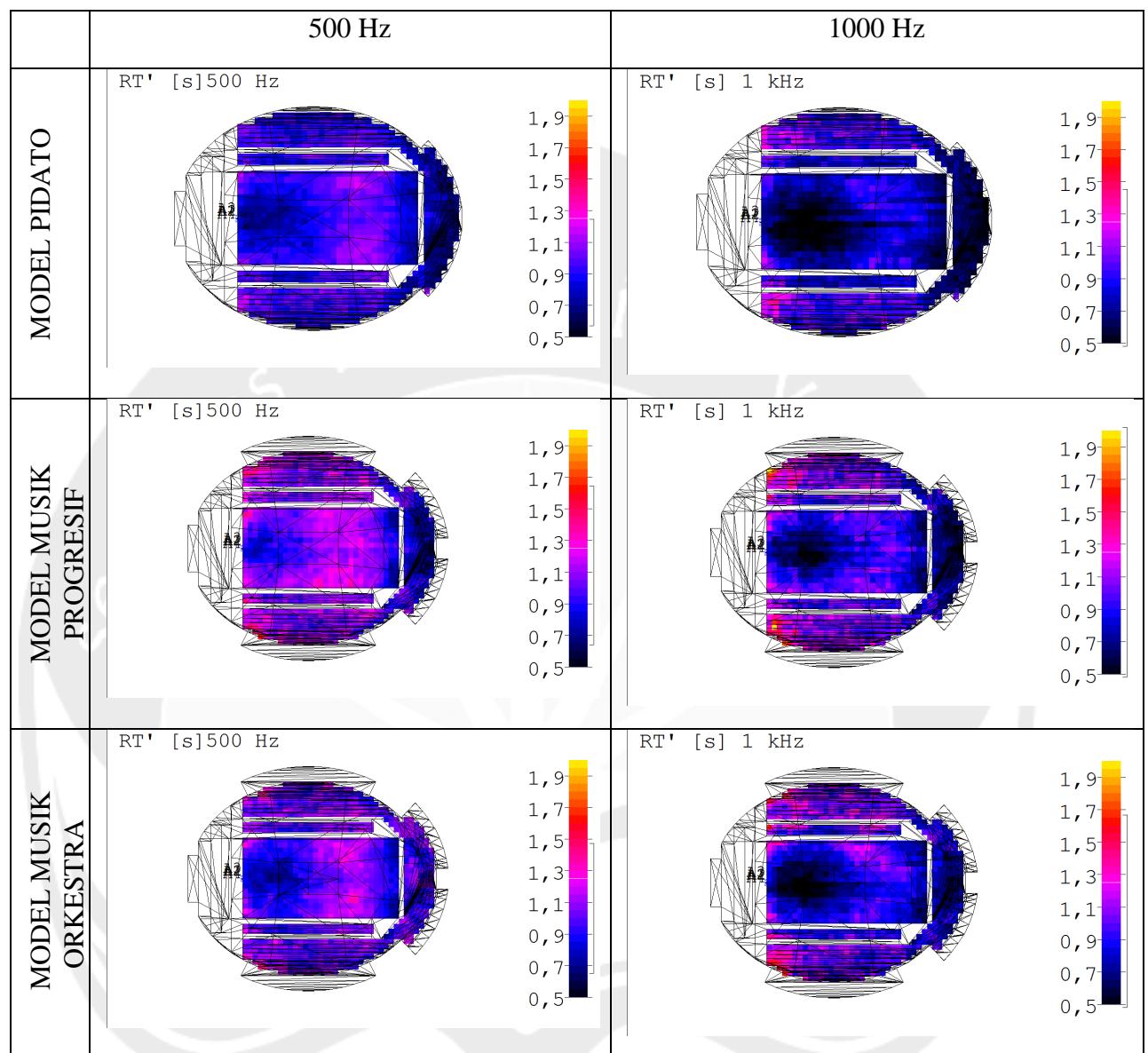
Lampiran 14 (lanjutan): Komparasi nilai T-30 hasil simulasi pada objek studi



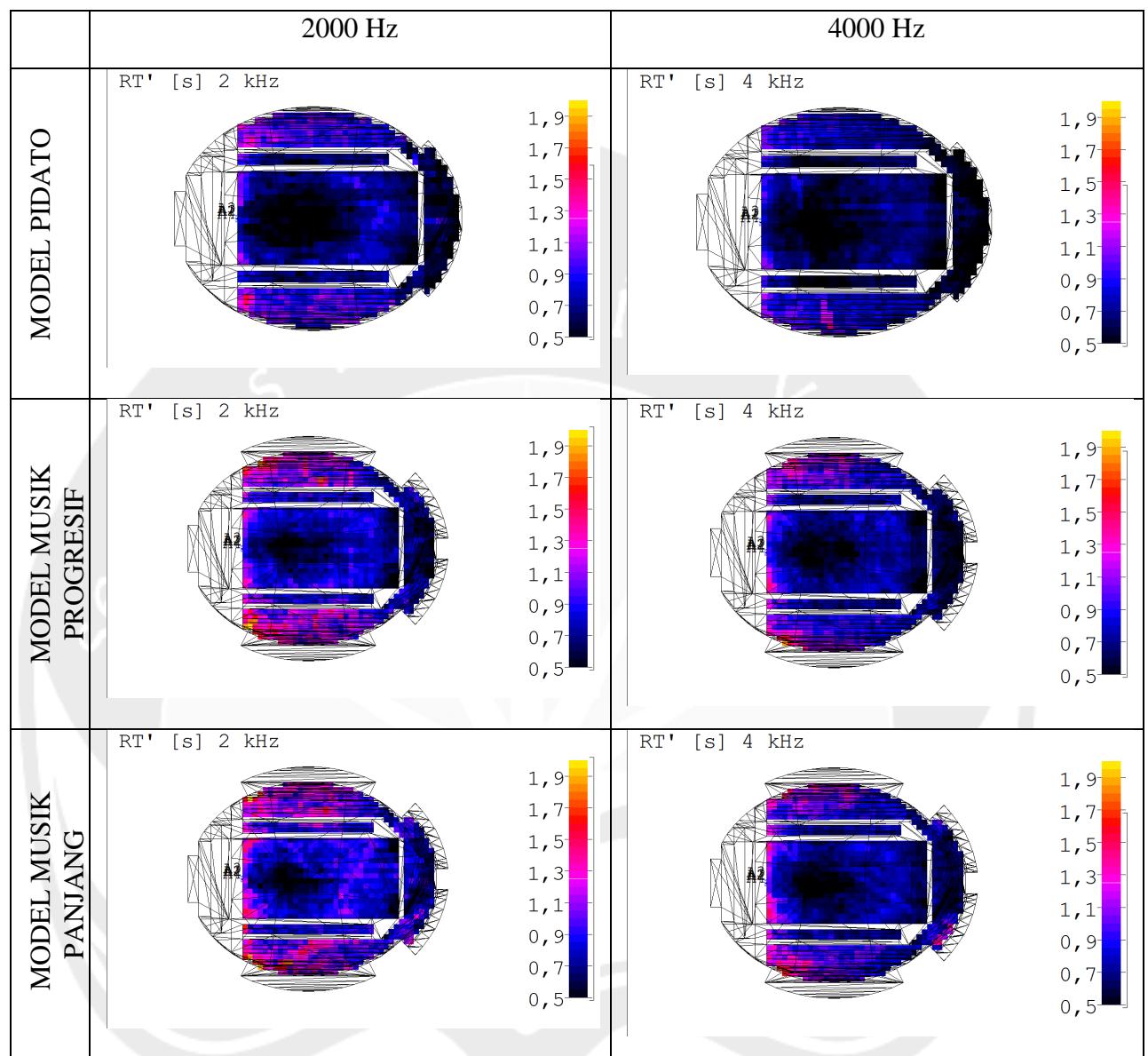
Lampiran 15: Komparasi mapping nilai RT hasil simulasi pada objek studi



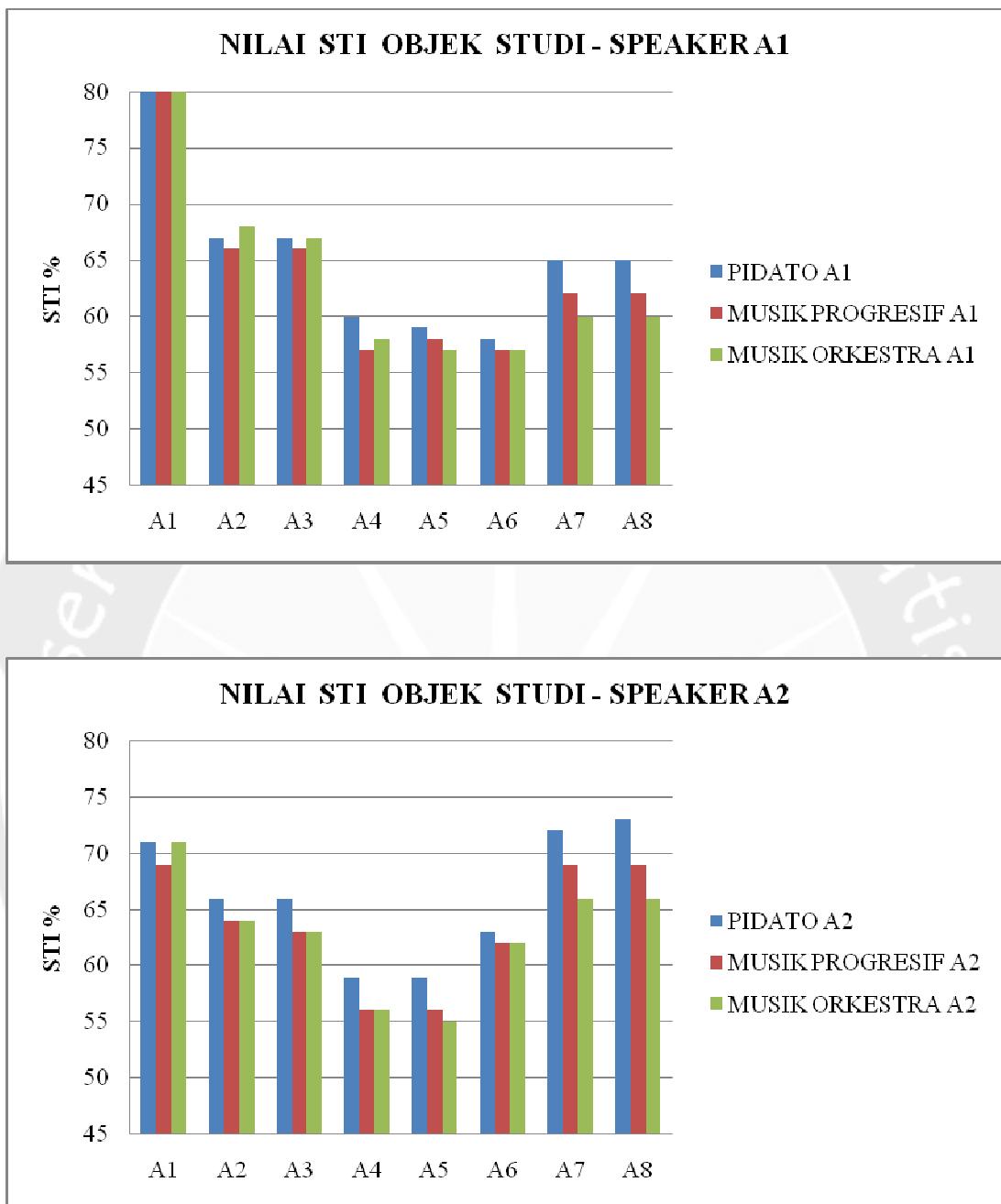
Lampiran 15 (lanjutan): Komparasi mapping nilai RT hasil simulasi pada objek studi



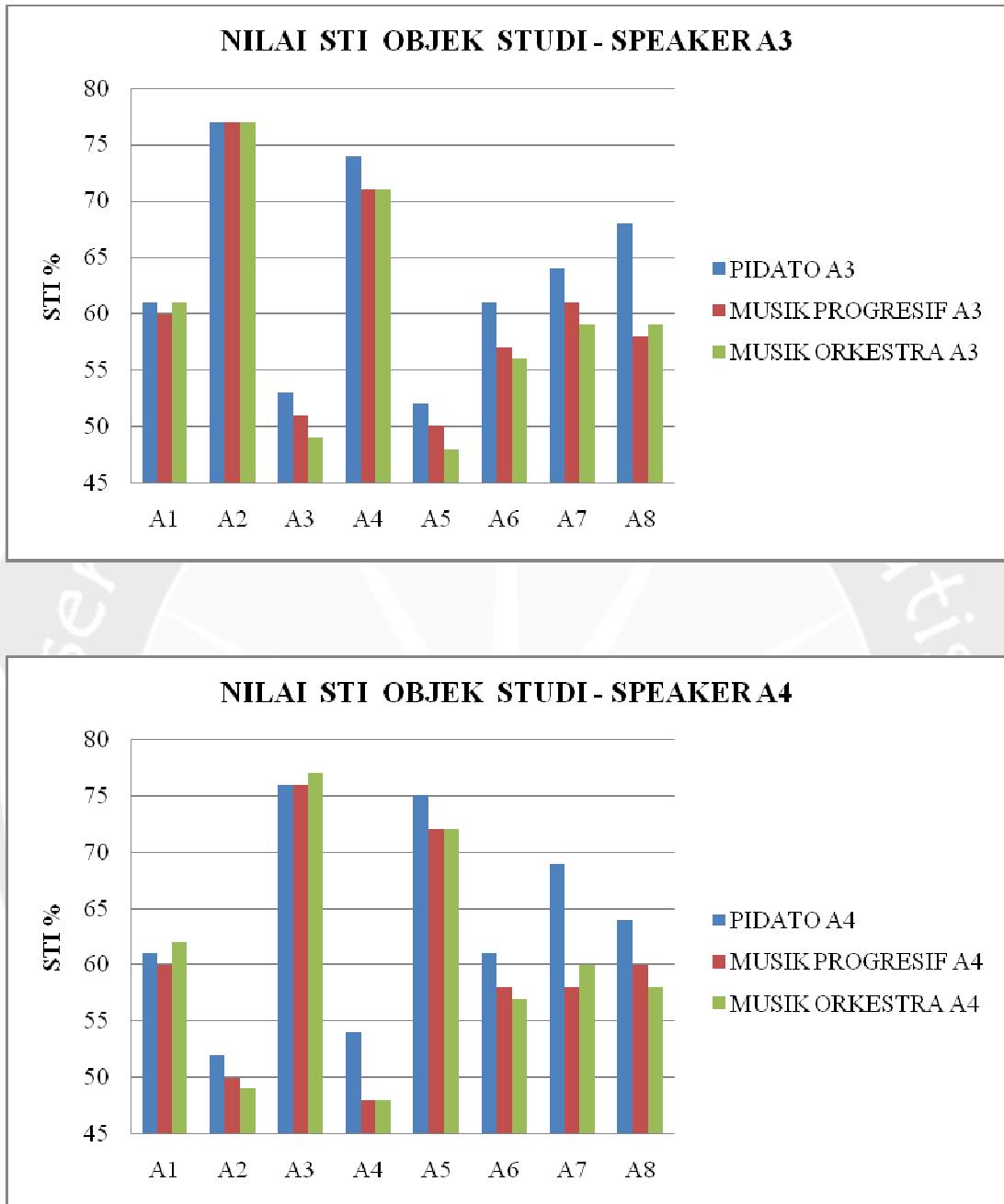
Lampiran 15 (lanjutan): Komparasi mapping nilai RT hasil simulasi pada objek studi



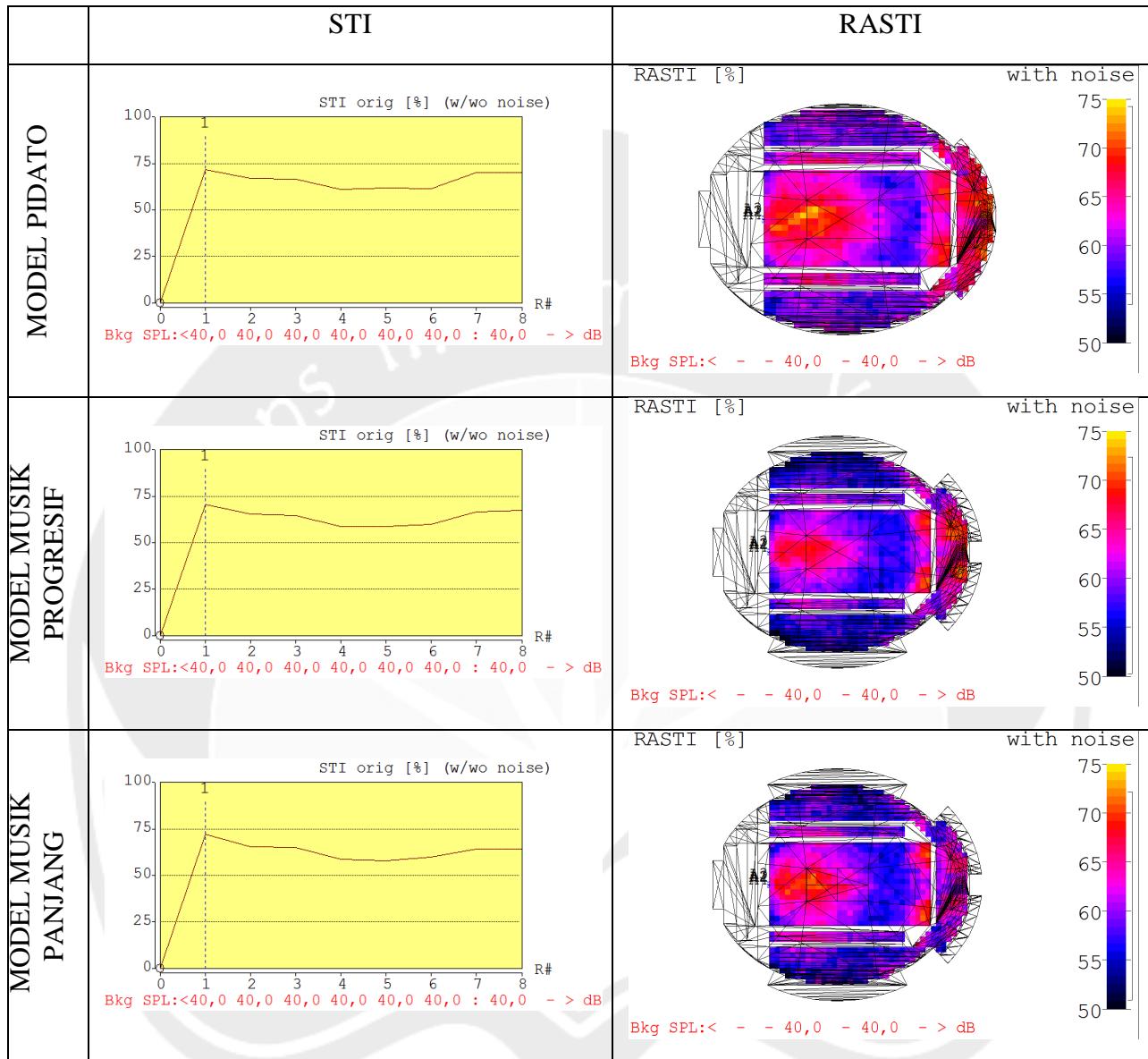
Lampiran 16: Komparasi nilai STI hasil simulasi pada objek studi



Lampiran 16 (lanjutan): Komparasi nilai STI hasil simulasi pada objek studi



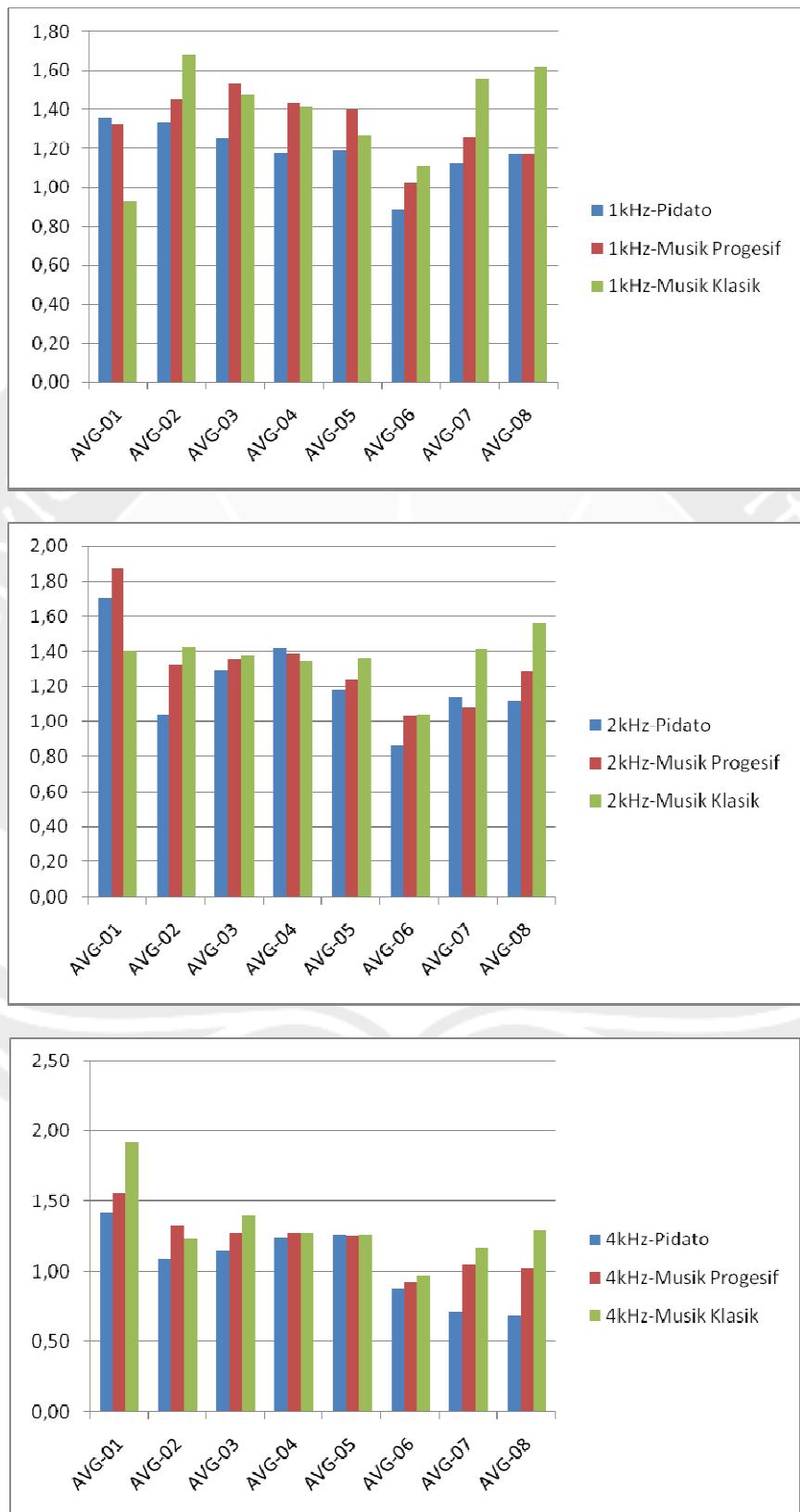
Lampiran 17: Komparasi mapping nilai RaSTI hasil simulasi pada objek studi



Lampiran 18: Komparasi nilai EDT hasil simulasi pada objek studi



Lampiran 18 (lanjutan): Komparasi nilai EDT hasil simulasi pada objek studi



Lampiran 19: Nilai G titik pengamat untuk kombinasi varibel fisik fungsi Olah Raga

|    | Nilai G (dB) untuk fungsi Olah Raga |           |           |            |            |            |
|----|-------------------------------------|-----------|-----------|------------|------------|------------|
|    | 125<br>Hz                           | 250<br>Hz | 500<br>Hz | 1000<br>Hz | 2000<br>Hz | 4000<br>Hz |
| A2 | 5.7                                 | 7.0       | 8.2       | 8.2        | 8.2        | 7.9        |
| A3 | 5.5                                 | 7.0       | 8.1       | 8.1        | 8.1        | 7.9        |
| A4 | 4.3                                 | 5.5       | 6.0       | 5.7        | 6.2        | 5.9        |
| A5 | 4.6                                 | 5.5       | 6.1       | 5.9        | 6.1        | 5.7        |
| A7 | 2.9                                 | 3.7       | 4.5       | 4.3        | 3.5        | 3.6        |
| A8 | 2.5                                 | 4.0       | 4.1       | 4.3        | 3.8        | 3.2        |

Lampiran 20: Mapping nilai G untuk kombinasi varibel fisik fungsi Olah Raga

