INTEGRATED AMPLIFIER

Galactron MK2240

One of the legends of high fidelity, Italian Galactron was launched in 1966 and became famous thanks to their distinctive designs (one of the most characteristic was their "vertical" MK16 preamplifier). Now, it seems to have returned with some serious plans for the high fidelity market.

Although, aesthetically, it is clear that the Italians have decided to move towards more conservative paths, the build quality of the amplifier under review seems to follow their old fashioned, quality-oriented philosophy. According to their history, Galactron was, probably, the first to use semiconductors with military specifications, in an era when even the use of semiconductors was already a controversial practice in the field of audio equipment. Also, it appears that they remained on the side of reasonable designs and technical consistency, not following today's extravaganza approaches often found in this particular market niche.

Galactron product list includes, at the moment of this writing, five integrated amplifiers with power stages based on complementary MOSFET topologies with a power range from the 40W per channel MK2240 up to the 80W MK2280, the latest being a dual mono design. Four of the five models are biased as class AB power stages while the MK2225 is biased as a class A power stage, delivering 25W per channel.

As already mentioned, the MK2240 reviewed in the following pages is the smallest model in Galactron's range. Nevertheless, it is an imposing device in terms of its physical presence, with some good features. With its low-to-middle power capacity, it is mainly addressed to those who would like to set up a high-spec system to cover a moderate or small space.

Dimitris Stamatakos

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I never cease to be amazed by the natural talent inherent in Italian industrial design and their ways to diversify even the simplest structure. Take for example the MK 2240. Without any switches, rotary controls or sliders on its front panel, without a visible external heat sink, and with an all-black glossy finish it is a good basis for an aesthetic disaster… Just imagine a hefty, featureless black chassis with a width of 45 cm in the middle of your rack. Yet, with just three recesses in the front and the sides, the housing of the MK 2240 is easily alleviated aesthetically and appears as a pleasant and diversified product from the rest of the pile. The contrast between the logos, in red color, and the black finish, complements the whole picture by proving that most things around us only need some attention to be more pleasant in the eye. In any case, of course, just a cleverly designed enclosure is not sufficient for an integrated amplifier as there are other important things to consider.

Chassis design and aesthetics are quite elegant, despite the rather simple front panel facade and the absence of any switches and knobs.

The simplicity of the facade, somewhat excessive in my opinion for reasons analyzed below, hides

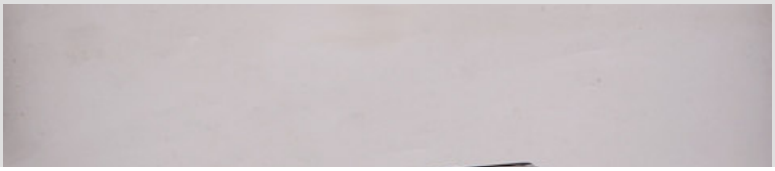
some of the functions offered by MK2240. The user has five line inputs at his disposal, a recording output and a line-level preamplifier output for driving an external power amplifier or active subwoofer. The later requires the installation of a low pass filter module inside the amplifier. The electronically controlled signal routing used in MK 2240 offers real tape monitoring. This allows the user to listen to the signal recorded to tape if a suitable machine is connected (either a three-headed analog tape deck or a monitor capable digital tape recorder), a feature not often included nowadays that recorders are a rarity. Nevertheless, a tape monitor loop offers some additional connectivity for an external signal processor (such as a digital room acoustics correction system) which surely is a good thing. Loudspeaker cable connection is done through two pairs of good quality binding posts that accept large gauge conductors terminated with all the usual methods.

Operation of the amplifier is possible solely through the remote control, an approach with which personally I disagree, since the user has no direct control when the remote runs out of batteries, has been misplaced or broken. Additionally, there is no visual cue for the volume setting. On the other hand the remote offers a positive feeling during its use and the option to store three level settings (as well as a mute button too) which make the user's life easier.

Galactron gives great importance to the correct temperature of the amplifier, hence the "Warm -Up" indicator which informs about the thermal status of the output stage. LED indicators for both level and balance adjustment are only lit during the setting time.

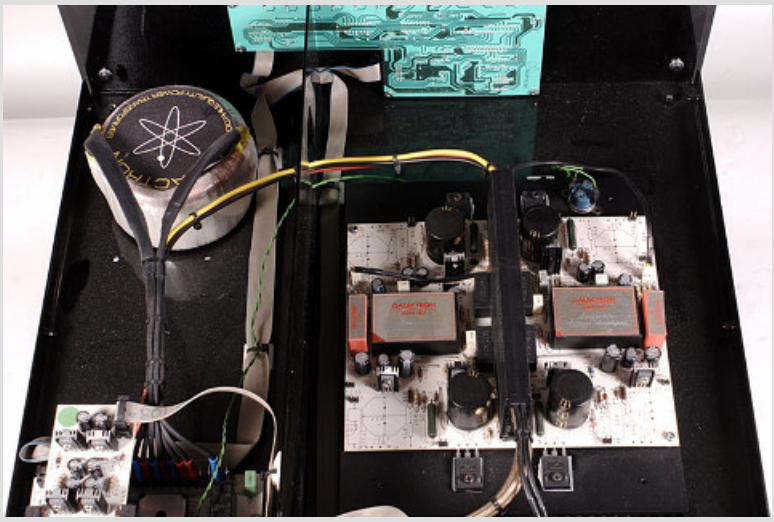
The remote is quite user-friendly and features, among other functions, a mute switch and memory storage for three different level settings.

A look inside the MK2240 reveals a simple but interesting design. Preamplifier stages are based on OPA2604 op amps and input selection is realized through electronic switching. Level setting is also electronically adjustable through a circuit custom-designed by Galactron and not through an off the shelf solution such as the PGA family of volume controllers. The power amplifier is based on a sealed module from Galactron (GSM-001) per channel for the voltage gain stage, a part of the circuit for which the company does not give any details.



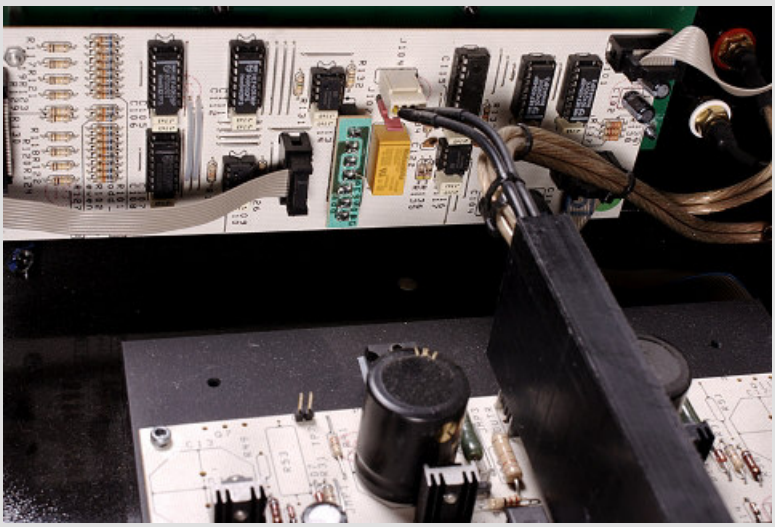
The back panel includes five line level inputs, a recording output (capable for three-head machine

monitoring), a bi-amp output and good quality binding posts to connect the loudspeakers.



Inside the chassis, one can easily spot the main transformer (at the left side) and the power amplifier board. The heat sink is located at the bottom of the enclosure.

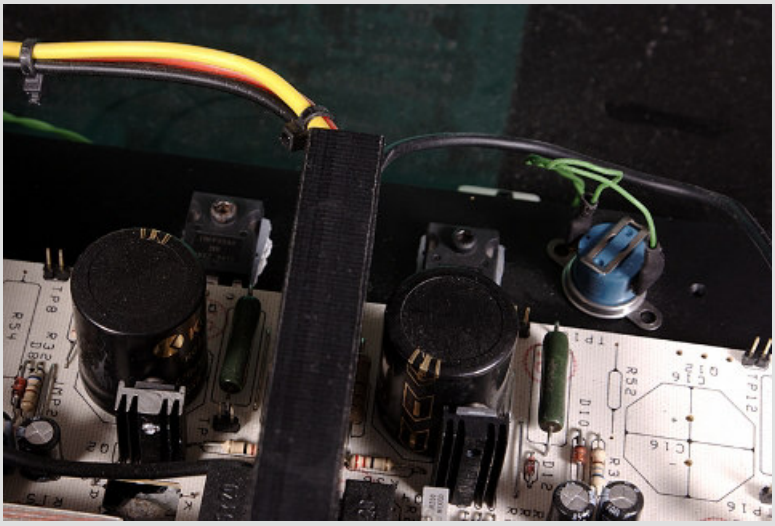
Power stage uses a pair of complementary MOSFETs from International Rectifier (IRFP2240/IRFP9240) biased for AB class of operation. Based on IR's typical specs, each one of these devices is capable of up to 20A current. These components are an interesting choice. The IR Hexfet technology was originally developed for manufacturing high quality (i.e very fast) semiconductor switches and not for linear applications such as those required in the audio industry. However, with a proper driver topology, it is possible to design high-quality power stages using these semis. First trial designs (some ten years ago) quickly followed by more popular projects. Finally, the publication of an application note from IR, offering solutions to all the difficult aspects of an audio amplifier design, officially put the components in the mainstream. You can read a related analysis here and the application note from the International Rectifier here, if you care about some interesting details.
Power supply for the whole amplifier is based on a toroidal transformer and features separate local regulators for both the preamplifier stage and the control circuitry. Power stage circuit boards include two 4.700uF capacitors (per channel).



This is the preamp stage. Input selection and level setting are electronically controlled. Part of the preamplifier circuit is implemented through Burr-Brown op-amps.

Galactron's GSM-001 module

functions as the basic voltage amplifier stage for the power amplifier circuit. The company does not give any details of what is under the protective cover.



Power stage is designed around a pair of IR HEXFETs (a MOSFET technology initially developed for high-speed switching applications). The photo also shows two of the power supply filter capacitors and the temperature sensor (to the right, located at the heat sink).

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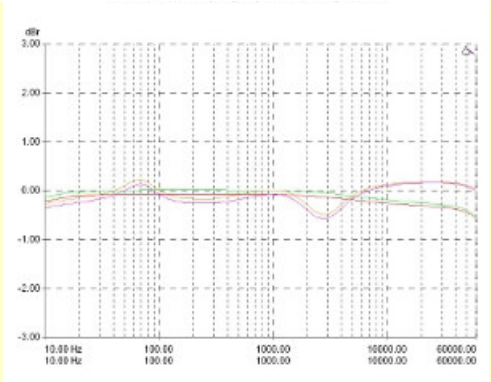
Near its clipping point, MK2240 yielded 45Wrms per channel into an 8-ohm load, a figure that rose at 76Wrms when the load was 4 ohms. With a rate of 1.7 in power increase, the amplifier appears to dispose of significant drive headroom with a low impedance loudspeaker. Damping factor was calculated to approximately 11, a value which leaves some room for deviation from the ideally flat frequency response, depending on the magnitude of the loudspeaker impedance, but, probably, these will be not significant.

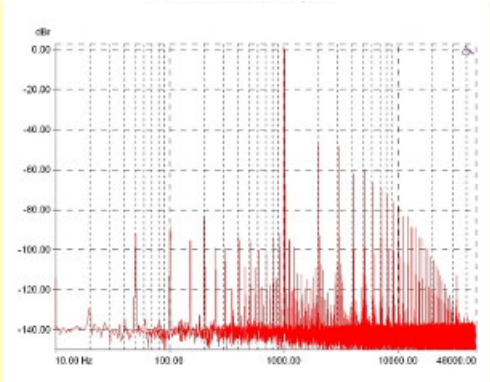
Static distortion measurements (in reference to the 1/3 of maximum power) were rather typical for the kind of output stage, with total harmonic distortion and noise at 0.68% for 8-ohm loads and 0.85% for 4-ohm loads. Same applies to intermodulation distortion (SMPTE), with 0.57% and 0.72% respectively. Harmonic distortion measurements (0.61% and 0.82% for 8/4-ohm loads) is an indication of good performance in noise since there is no significant difference between these figures and the THD+N. Signal to noise ratio (with a reference level corresponding to 1Wrms /8-Ohm) measured to -80.6dBr(A), which could be considered as a very good result.

Frequency response with resistive loads found to be practically flat up to 60kHz with a slight reduction of 0.5dBr (in full accordance with the specs given by the company). Its main feature is a very slight slope that starts quite early (in 20kHz deviation is near 0.3dBr). Differences between the two channels were very small, near 0.1dB. Response measurement using complex loads revealed a slight deviation with a peak around 0.2dBr at low frequencies and a deep of about 0.5dBr near 3kHz. This was expected, given the low damping factor figure already mentioned.

Output signal spectrum with a 1kHz signal input comprised a number of harmonics, strongest of which was the one of the second-order (near -50dBr). There were also some intermodulation products (observed between the harmonics) mainly from the power supply. These are at very low levels around and below -100dBr. Power supply noise is also visible (at 50/100Hz) with some components around -80dBr.

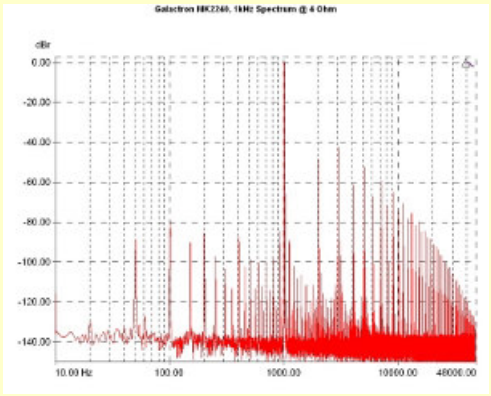


Frequency response for both channels. Reference level: 1/3 of maximum power in 8-Ohm load, (green/red curve), and in complex (simulated loudspeaker) load (orange/magenta).

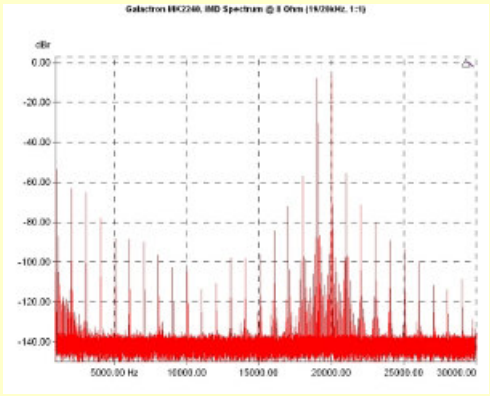


Spectrum analysis with 1kHz signal input. Reference level: 1/3 of maximum power in 8-Ohm load.

Using a 4-ohm load, the spectrum of the harmonics was not significantly altered although one can see that the components are somewhat at a higher level and that the odd harmonics are slightly dominant.
Intermodulation spectrum (with a 19/20kHz 1:1 amplitude ratio signal) comprised the anticipated components (including those relating to noise) at low enough levels, around and below the -60dBr both with an 8-ohm and…

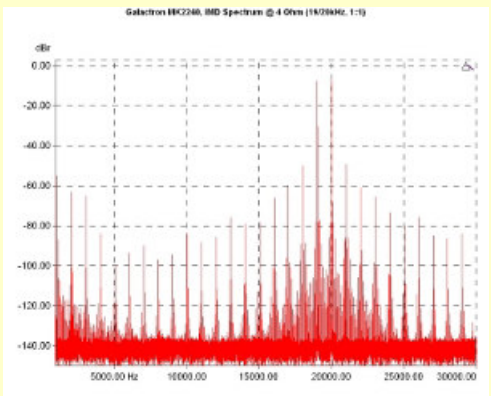


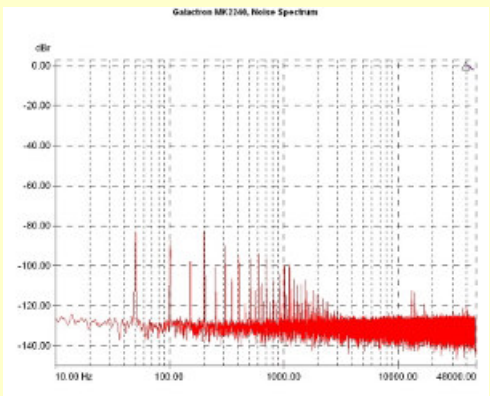
Spectrum analysis with 1kHz signal input. Reference level: 1/3 of maximum power in 4-Ohm load.



IMD spectrum analysis. Two-tone, 19/20kHz, 1:1 level ratio signal. Reference level: 1/3 of maximum power in 8-Ohm load

…with a 4-ohm load. In the later case, values were somewhat higher. Pay attention that the horizontal scale here in both IMD graphs is linear and not logarithmic, therefore the “feeling” is a little bit different from the normal harmonic distortion or frequency response graphs.
Noise spectrum with shorted inputs included primarily hum/power supply noise components at 50/100Hz as well as their intermodulation products. All these are at very low levels (less than -80dBr, with a reference level corresponding to this 1Wrms/8W). The amplifier was, also, very quiet in the high-frequency range, where there are few findings that stand out, a sign that the control circuits are well isolated from the main circuit.





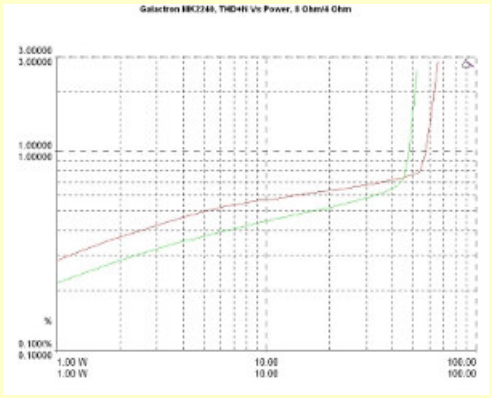
IMD spectrum analysis. Two-tone, 19/20kHz, 1:1 level ratio signal. Reference level: 1/3 of maximum power in 4-Ohm load.

Noise spectrum. Reference level: 1Wrms in 8-Ohm load, input shorted.

Harmonic distortion and noise (THD+N) as a function of signal frequency fell in the region of 0.2-0.3% for the low-frequency part of the spectrum. Above 1kHz showed a mild upwards trend until around 1% where it remained constant until the upper limit of measurement (20kHz) was reached. With a 4-ohm load, the behavior was about the same with distortion values being slightly higher towards the low-frequency region.

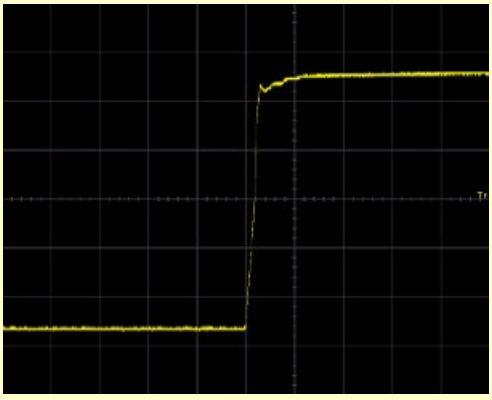
MK 2240's power stage proved capable of a rather smooth distortion behavior in relation to the power output. Relevant graphs show a slight upwards trend until the point where the overload begins. This point is about 44Wrms for 8-ohm loads and 54Wrms for 4-ohm loads.

THD+N as a function of frequency at 1/3 of maximum power in 8-Ohm load (green curve) and 4-Ohm load (red).



THD+N as a function of the output power. 1kHz input signal in 8-Ohm (green curve) and 4-Ohm (red) load.

Finally, the MK 2240 proved to be a quite fast amplifier with a rise time of 1.12uS (which corresponds to a conventional range slightly larger than 300kHz) and a slew rate of 38V/uS. The corresponding squarewave waveform includes only minimal overshoot and distortion.



1kHz squarewave response. Maximum output voltage in 8-Ohm load. Horizontal axis: 5uS/Div, vertical axis: 10V/Div.

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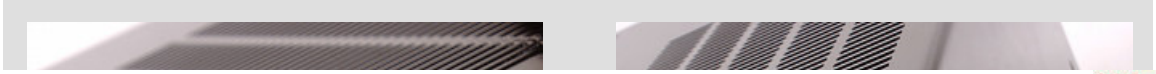
The system used for the listening evaluation of the MK2240 included the ATC SCM-50 PSL loudspeaker and the Teac Esoteric P70/D70 CD Transport/DAC pair. Galactron's amp replaced our preamplifier/power amplifier pair used on a regular basis (Melos Plus Series Line / Parasound HCA3500).

HK2240 is quite easy to install and all you will need is some reasonable free space above the chassis. The heat sink is cleverly positioned at the bottom of the amp so that it remains invisible and does not put any additional restrictions. Galactron, on the other hand, is quite strict on the issue of correct circuit temperature, especially on the output stage. For this reason, the amplifier has an LED indicator that signals when the amplifier is ready to reach its full potential. Warm-up time is several minutes (to be honest, during the first power-up I had the feeling that the "correct" temperature will never be reached, but, obviously that was a wrong one). Controlling the device from the remote proved to be easy and the only thing one can complain about is that there is no indication of the current level, just an LED flashing during the adjustment. One side solution to this "problem" is to systematically use the volume presets and mute switch.

First impression during the listening test was that of an amplifier with a very good dynamic headroom, one that could both easily follow and recreate the macro dynamics in any given track and offer some realistic levels in a small/medium sized room. With the HK2240 in place, the system maintained its capacity to give a proper sense for any mix, without compression and without creating any listening-related fatigue. Of course, the amplifier's power rating does not allow for excessive levels and there is a limit that should not be exceeded, although -even then- the end result is quite ear-friendly nor harsh or extremely unpleasant. Given that these good results were achieved with a low sensitivity loudspeaker, a more reasonable choice would be something rated around 90dBSPL/w/m. This will guarantee more comfortable drive conditions, higher levels and/or the possibility to cover a larger room.



The amplifier appeared transparent and neutral and if there is any deviation from these attributes, it is towards a somewhat more relaxing, pleasant and delicate high-frequency behavior. This part of the spectrum emerged with good brightness and rich harmonics, quite a fast attack and precise sustain/release times with slightly thinner body than what I'm used to from the reference.
Very small differences between the channels and the apparent precision in level tracking through the custom made volume control (around 0.1dB over the usual settings range) offer some serious expectations for good stereo imaging and praxis, confirmed these expectations. MK2240 proved more than capable to create a soundstage with very good width and extremely clear focus of individual sound sources. A very good description both of the size and the feeling of movement in large organic groups such as the symphonic orchestra was apparent, with depth, detail and realistic acoustic spaces being at the same level. In general, the good performance of the amplifier is something quite tangible, and "great sound" is a phrase that comes spontaneously to mind. Voices were reproduced accurately, with good articulation, the chorus being impressive and the soloists "present" and well defined in the space between the loudspeakers. The amp was great in describing small details (probably due to its speed and low noise) and offers a good perspective for choices made during track production.
Towards the lower part of the frequency range, the amplifier sounded well controlled, offering a good balance between a well bodied and sufficiently detailed description. Some rather extreme - in low-frequency content- works filled the room seamlessly and with a feeling of authority. Given that your level expectations are not extravagant, you get full and pleasant sound, with fast and dynamic rhythm parts and a good sense of scale in the description of acoustic music instruments. Although it sounds somewhat of a clich?, it is fair to write that the small Galactron sounds as a much larger amplifier, after all!

Conclusion

Galactron's MK2240 is an amplifier designed with the technical perfection in mind -given some cost based constraints obviously- but there should be no doubt that the main objective here was the aural satisfaction of the listener. Indeed, these two generally go together, but there are cases where you really feel you have reached a tacit inner balance and that you came up against a truly audiophile product. This fully applies here. MK2240 is one of the best integrated amplifiers to consider in a system setup that will work in a small or mid-sized room (in the later case with some mid/high sensitivity loudspeakers) and the price asked is quite reasonable.

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