# Episode Book

EPISODE #6367

## Why Windows Struggle with Bass

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### SYNOPSIS

Double-pane windows block street noise effectively, yet late-night bass still leaks through to disrupt sleep. Standard sound transmission class ratings often omit deep low frequencies, while trapped air between glass panes can create resonances that transmit rhythmic pulses. Exploring sound transmission physics, room modes, and masking experiments reveals why small white-noise machines fail to cover kick drums—and why adding a bedroom subwoofer introduces as many acoustic problems as it solves.

# TRANSCRIPT



**Corn**

At sixty hertz, a sound wave is about eighteen feet long. Daniel's dual-pane windows are being asked to keep that outside while a nearby bar plays into the early morning. They block plenty of the music, but the bass keeps getting through.



**Herman**

The window has a much easier job with the singer than with the kick drum.



**Corn**

Daniel recorded the sound on his balcony and asked Claude about it. Claude identified the dominant band as forty to one hundred sixty hertz, then suggested a bedroom subwoofer playing steady masking noise. Keep it off the ground, spare the neighbours, and fill in the gaps between the bar's bass pulses.



**Herman**

A plausible mechanism, with a rather large bedroom experiment attached.



**Corn**

Daniel already has a white-noise machine, and the pulse still cuts across his focus. He wants our opinion on whether the bigger speaker would actually help. I can see the attraction, Herman. I can also see him buying a second source of the exact thing keeping him awake.



**Herman**

The friendly AI down the road has identified a real limitation of small noise machines. Whether fixing that limitation buys Daniel sleep is a different matter.



**Corn**

Bass, now available from both sides of the window.



**Herman**

Two things need separating. Transmission determines what reaches the room. Perception determines what that sound does to Daniel once it arrives. A window can substantially reduce the overall sound level while leaving precisely the part he finds hardest to ignore.



**Corn**

He's not describing a room full of obvious music. The conversations and ordinary sounds continue, and underneath them there's this recurring low-frequency event. That's almost worse for concentration, because you keep discovering it again.



**Herman**

The recurrence matters. A steady rumble gives your auditory system something relatively unchanging. A bass line rises, stops, resumes, changes notes. Those changes keep offering your attention fresh events. Not everybody responds equally strongly, but Daniel knows what happens to his own focus.



**Corn**

I suspect you'd tolerate considerably more bass if you selected it.



**Herman**

I would, and that's relevant. Predictability and control affect how sound lands. DJ Herman at the controls and Herman trying to sleep are not acoustically different animals, but they have sharply different opinions about the same kick drum.



**Corn**

One of them owns the volume knob.



**Herman**

Corn, suppose the bar became an unchanging rumble at the same average level. Would that satisfy you, or would the rumble itself still be a problem?



**Corn**

I'd expect improvement, not silence. When I'm settling down, a continuous background can disappear from attention. A beat leaves an appointment for the next beat. But I wouldn't accept twice as much rumble just to remove the appointments.



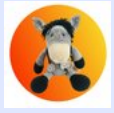
**Herman**

That sets the useful test. The goal would be less noticeable fluctuation at a tolerable total level. Merely making the bedroom sound steadier doesn't establish that it's better for sleep.



**Corn**

Claude's certainty is the part I'd trim. The speaker can reproduce those frequencies. That doesn't tell us what Daniel will experience with it running beside the bed.



**Herman**

Nor does a balcony recording completely describe the bedroom. The building and the room change the spectrum. Forty to one hundred sixty hertz is a sensible working range here, not a complete map of what reaches the pillow.



**Corn**

His windows can still be doing a good job, then. They're removing enough of the rest that the bass becomes the surviving nuisance.



**Herman**

Mass law helps explain that. Away from resonances, a heavier partition generally blocks more airborne sound, and its isolation improves as frequency rises. Low-frequency pressure changes can move a lightweight panel relatively effectively. Glass has mass, but ordinary glazing doesn't offer enormous low-frequency isolation.



**Corn**

The eighteen-foot wave sounds decisive, but I don't quite buy comparing its length with the wall's thickness. A thin sheet can reflect sound. It doesn't have to swallow the whole wave.



**Herman**

You're right to stop there. The wavelength comparison conveys the scale, but thickness divided by wavelength isn't a soundproofing formula. A wall doesn't need to be eighteen feet thick. Its mass, stiffness, supports, cavities and resonances determine how it responds.



**Herman**

A partition only a few inches thick can still provide useful isolation. What we cannot assume is that its performance against speech carries down to deep bass. That is where the simple window sales number becomes misleading.



**Corn**

An excellent speech rating. The bar declines to speak.



**Herman**

STC, sound transmission class, is weighted toward a frequency range useful for speech isolation. It doesn't properly describe deep bass performance. Even the bottom of its standard rating range leaves much of Daniel's reported band outside the calculation.



**Corn**

I'd want the actual transmission-loss curve, then. Not because everyone needs to become a glazing engineer, but because two windows with similar headline ratings could behave differently on the one bass note bothering you.



### Herman

They can. Double glazing also introduces a particular resonance. The panes supply two masses, and the trapped air acts as a spring between them. Near that system's resonant frequency, the panes can transmit sound more readily than you'd expect from simply adding their individual masses.



### Corn

Two panes, one unfortunate collaboration.



### Herman

Different pane thicknesses, cavity depths and damping change that behaviour. Tocci's work on glazing describes these stiffness resonances reducing transmission loss. A separate double-glazed-window analysis found a pronounced drop near one hundred twenty-four hertz, directly inside Daniel's reported band.



### Corn

Not a diagnosis of his window, though.



### Herman

No. A concrete example of why double glazing can have a weak spot there. We don't know his pane construction. Also, there's another phenomenon called coincidence, where bending waves in a pane couple efficiently to airborne sound. That's a different dip, often at higher frequencies. We shouldn't bundle every glass resonance into the bass explanation.



### Corn

You're resisting the complete taxonomy. I'm impressed.



**Herman**

I have the taxonomy available.



**Corn**

I know. Your breathing changed.



**Herman**

The useful distinction is that an airtight, correctly installed window can still transmit low frequencies. A defect or gap might worsen matters, but hearing bass alone doesn't establish either.



**Corn**

There's a second possibility I don't want us to assume away. What if some of the sound isn't entering through the glass at all? Closing a window doesn't disconnect the floor.



**Herman**

Structure-borne transmission can matter enormously, especially where a venue shares a building or connected structural elements with the bedroom. A loudspeaker can excite floors and walls. Those vibrations travel through the structure and can become airborne sound again in another room.



**Corn**

A nearby bar doesn't necessarily share that path, though.



**Herman**

Correct. Between separate buildings, airborne transmission may dominate. We cannot infer a concrete connection from Daniel's recording. There can also be flanking paths around the window through other building elements. Several routes can coexist.



**Corn**

That distinction becomes expensive if you buy new glazing to cure a vibrating floor.



**Herman**

It does. What would you make of bass that changes sharply when you move your head across the bedroom, Corn?



**Corn**

I'd suspect the room is amplifying certain positions. Though I might first accuse you of adjusting something.



**Herman**

Fair. Room modes produce peaks and dips at low frequencies. Moving the listener, or later a speaker, changes which peaks you encounter. A balcony spectrum won't capture those bedroom effects.



**Corn**

None of that yet explains why a quiet pulse can be so commanding. I can ignore a refrigerator for hours. Give it a kick drum and suddenly I'm involved.



**Herman**

Amplitude modulation is the relevant description. The level rises and falls. The bass frequency and the rate of those rises are separate things. A low note can be switched or shaped into a beat much slower than the note itself.



**Corn**

The carrier is low, but the interruption has its own timing.



### Herman

Yes. There's an interesting low-frequency hearing experiment here, but... we need to keep the distinction intact. With very low pure tones, perceived loudness depends on how long they're presented. At sixteen and thirty-two hertz, that duration effect settles after roughly a second.



### Corn

Whereas at the very bottom?



### Herman

At four hertz, individual pressure cycles can be perceived as separate pulses, and longer exposure continues to affect audibility. That shows how low-frequency hearing can become event-like. It doesn't directly prove why a nightclub beat carried by much higher bass is annoying. The musical envelope and a four-hertz pure tone aren't the same stimulus.



### Corn

Useful clue, wrong experiment to crown king.



### Herman

Our attention responding to repeated changes is enough to make Daniel's experience intelligible without that leap. Average level also hides those changes. Two sounds with similar averages can have different peaks and very different temporal patterns.



### Corn

A noise meter can give you a calm-looking number while the room keeps going thump.



### Herman

Woolworth has specifically criticised how design predictions and noise rules can miss both low-frequency content and its pulsing character. Individual response adds another complication. In a laboratory study of low-frequency environmental noise, differences



### Herman (continued)

between participants accounted for more variation in annoyance ratings than the tested noise types or levels.



### Corn

That doesn't mean level is irrelevant. It means my ability to sleep through something wouldn't tell Daniel what he ought to tolerate.



### Herman

Nor would mine. Reports from people troubled by low-frequency noise include disturbed sleep, fatigue and repeated unsuccessful attempts to escape it. There is no useful instruction hidden in telling him to stop noticing.



### Corn

Especially when noticing is the problem he came with.



### Herman

Masking tries to reduce that noticeability by supplying competing sound in relevant frequency bands. For strong masking, you need enough energy near the intruding sound's frequencies, often comparable to or greater than it there. Total loudness alone won't do it.



### Corn

Turning up hiss doesn't necessarily cover a kick drum.



### Herman

Small white-noise speakers often roll off the bass because they cannot reproduce it cleanly. Manufacturers may deliberately remove low frequencies to prevent distortion. The noise file might contain bass while the box produces almost none of it.



**Corn**

White noise, with the difficult colours removed.



**Herman**

NoisyWorld measured a large commercial noise machine against low-frequency footfall noise. Around forty hertz, the machine was more than twenty decibels below the intrusive peak. That's a substantial spectral shortfall. It explains why simply raising the machine's volume can produce lots of upper-frequency noise without covering the thud.



**Corn**

We shouldn't declare Daniel's particular machine useless without hearing it. But the fact that it sounds substantial beside the bed doesn't establish useful output down there.



**Herman**

A capable subwoofer addresses that hardware limitation. Some reproduce thirty hertz comfortably, with deeper models reaching lower. Covering much of forty to one hundred sixty hertz is plausible, though the upper end also depends on the subwoofer's crossover and playback setup.



**Corn**

You are about to say this makes an elegant little system.



**Herman**

It does make a technically coherent system.



**Corn**

There it is.



### Herman

Coherent isn't comfortable. I grant you the distinction before you make me sleep beside it.



### Corn

My objection is the extra energy. If the bar's peak stays exactly where it was, and I fill the quiet gaps, haven't I merely brought the whole night up toward the worst part?



### Herman

Physically, the two sources add sound energy. Perceptually, that smaller contrast can make the bar less distinct. The pulse might become harder to pick out even though the room's total level increases. That's the potential benefit, and also the cost.



### Corn

I'd call that worth trying only if a fairly modest background makes the beat disappear from attention. If it takes a bedroom-sized engine rumble, we've exchanged an intermittent disturbance for a permanent one.



### Herman

I agree with the boundary, although partial relief can count. Complete inaudibility isn't necessary if the remaining sound no longer captures attention. Corn, would you accept still hearing the bar when deliberately listening for it?



### Corn

I'm trying to sleep, not win a blind identification trial. But the background has to be agreeable on its own. That's why I don't want Claude's confidence converted straight into a purchase.



### Herman

There's no direct controlled bedroom trial establishing that this setup reliably masks nightclub bass. The case rests on masking principles and practitioner measurements, extrapolated to Daniel's situation. Plausible experiment, uncertain outcome.



**Corn**

The frequency generator he asked about does exist in a useful form, though. We don't need a special box that only generates forty-hertz gloom.



**Herman**

Filtered noise is the better approach. A pure sine tone occupies a very narrow band. It could miss changing bass notes, remain conspicuously tonal, or produce audible beating with a nearby frequency. Broad but shaped noise covers a range without introducing one obvious note.



**Corn**

Paying to install your own persistent hum seems unambitious.



**Herman**

Brown noise is one starting point. Its spectrum falls toward higher frequencies, giving it a deeper balance than white noise. The published brown-noise ladder offers versions with different low-frequency roll-offs, from thirty to one hundred hertz.



**Herman**

Those are gradual filters, not brick walls. The practitioner recommendation is to begin around eighty to one hundred hertz and extend lower only if needed. Deeper isn't automatically better.



**Corn**

That runs against the subwoofer-shopping instinct. You buy the impressive low number, then discover the most restful setting barely uses it.



**Herman**

In one footfall-masking example, a sixty-hertz roll-off worked best, while somewhat higher settings were nearly as useful. That doesn't establish Daniel's setting. It demonstrates why tuning for tolerability can matter more than maximising extension.



**Corn**

Keep enough bass to reduce the pulse, remove enough bass to live with the cure.



**Herman**

The files also taper the treble to avoid unnecessary hiss, and seamless playback matters. A conspicuous loop boundary would introduce exactly the recurring event we're trying to reduce. A phone or computer can supply this. A subwoofer supplies output capability, not the noise design.



**Corn**

Could his existing machine supply the signal, rather than buying another generator?



**Herman**

If it has a headphone output, potentially. A powered subwoofer with a compatible input could receive it, although some setups need level adjustment or other connection hardware. Also, if the machine removes bass electronically, a larger speaker cannot restore missing frequencies.



**Corn**

Bigger lungs, same missing sentence.



**Herman**

Placement complicates the bedroom trial further. Corn, where would you put it if the aim were the least disturbance beyond your pillow?



**Corn**

Near enough that I don't need to fill the entire room. Not balanced on something merely because it's technically off the ground. You'd enjoy finding the loudest corner. I'd want the quietest successful arrangement.



**Herman**

A close position can reduce the output required at the listener, but room modes still matter. A corner often reinforces bass, sometimes unevenly. The right position is judged at the pillow, with attention to what reaches adjoining rooms.



**Corn**

Raising it onto a rigid cabinet could turn the cabinet into part of the problem.



**Herman**

Isolation means reducing mechanical coupling, using suitable supports and a stable arrangement. Elevation alone guarantees nothing. Airborne bass can still excite floors and walls, even when the speaker cabinet is well isolated. Nor can masking remove a vibration Daniel physically feels.



**Corn**

His chest does not accept noise cancellation by persuasion.



**Herman**

Headphones offer a different route. Active noise cancellation often performs particularly well against low-frequency airborne sound. Suitable headphones or sleep-compatible earbuds may reduce the incoming bass without broadcasting another source through the flat. Comfort, fit and effectiveness against changing beats still vary.



**Corn**

Your ears would make the headphone fitting appointment substantial.



**Herman**

They require accommodation. Ordinary headphones can also reproduce masking bass better than a tiny noise machine, but cancellation has the advantage of reducing some sound rather than only adding it. Neither approach guarantees relief from a vibrating bed.



**Corn**

The speaker experiment still needs isolation, then, and a low enough operating level that it doesn't become another neighbour's problem.



**Hilbert**

Isolation is rather generous, Corn. Lev at the audio shop keeps calling four rubber feet isolation. I'm still arguing with him about the subwoofer he quotes me this month. Front-firing, two thousand one hundred shekels. I don't buy it. He keeps putting a down-firing one back on the quotation because it's cheaper.



**Herman**

Driver direction alone doesn't determine what the downstairs flat receives. Deep bass spreads around the enclosure. The support and the building matter too.



**Hilbert**

I accept that. I still don't want the cone underneath. Lev wants to demonstrate it on the shop's tiled floor. I want to hear it in my bedroom. We are not making progress. He offers delivery, but he won't give me a straight answer about taking it away again.



**Corn**

Delivery is the easy half of that experiment.



**Hilbert**

He has a picture of the feet. I have the photograph enlarged because the same picture also shows a soup spoon, and I want to know whether the feet are actually that size. He says the spoon is irrelevant. I say he puts it in the picture. Herman, you explain a crossover more clearly than he explains a return.



**Herman**

A demonstration in a different room wouldn't settle the level you need at home anyway.



**Hilbert**

That's why the quotation is still on my table. He offers a longer cable this morning. I don't need a longer cable until we settle whether I can return the speaker. His assistant is trying to get an answer from the distributor. She actually calls when she says she will.



**Corn**

...



**Corn**

A home trial with a workable return matters more here than another impressive bass specification. My view is that Claude has the right speaker class, but promises too much about the result. I'd explore something worn at the ear before buying a bedroom subwoofer. If the extra rumble has to compete with a bar's peaks, Daniel may simply become another source of bass through somebody else's wall.



**Herman**

Thanks to Hilbert Flumingtop for producing the show.



**Corn**

If you enjoyed this one, try episode eight, Building Your Own Whisper; episode two, Local STT For AMD GPU Owners; and episode ten, How ASR Went From Frustration To ... Whisper Magic. This has been My Weird Prompts. No question too obscure, no rabbit hole too deep.



**Herman**

If you enjoy the show, leave us a review wherever you listen. It helps other curious people find us.



**Corn**

See you tomorrow.



**Herman**

Until then.

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