



Acoustical Criteria for Hospital Patient Rooms Resolving Competing Requirements

Bennett M. Brooks, PE

**Brooks Acoustics Corporation
Vernon, CT
www.brooks-acoustics.com**

Paper 2aNS1 -- 11 November 2003

Acoustical Criteria for Hospital Patient Rooms

Resolving Competing Requirements – ASA Austin – 11/11/03 – 2aNS1

Abstract

The acoustical criteria for patient rooms in hospitals, nursing homes and rehabilitation facilities may be based on several needs. One important requirement is that noise levels in the room be conducive to restful sleep. Also, caregivers must have easy auditory and visual access to the patients, and be able to hear vital sign monitor alarms. This often means that patient rooms are located near central nurse stations and that patient room doors are left open. Further, the recently published federal privacy standards developed by the U.S. Department of Health and Human Services (HSS) under the Health Insurance Portability and Accountability Act (HIPAA) require that "appropriate physical safeguards" be put in place to protect the confidentiality of patient health information. The simultaneous and competing requirements for speech privacy, caregiver access and good sleeping conditions present a serious acoustical challenge to health care facility designers. Specific facility design issues and potential solution strategies are presented.

Acoustical Criteria - Hospital Patient Rooms

Acoustical Functional Requirements

- **Hospital Patient Rooms**
 - **Inpatient unit, overnight stay**
 - **Emergency rooms**
 - **Post-op recovery rooms**
- **Nursing Homes**
- **Rehabilitation Facilities**

Acoustical Criteria for Hospital Patient Rooms

Acoustical Functional Requirements

Based on several **competing** needs:

- Quiet rest and *sleep*
- Caregiver *access*
- Patient *privacy*

Acoustical Criteria for Hospital Patient Rooms

Acoustical Functional Requirements

Quiet rest and *sleep*

- **Minimize disturbances**
 - **from outside and inside room**
 - central nurse station**
 - hallway / semi-private room**
- **Low mechanical system noise**

Acoustical Criteria for Hospital Patient Rooms

Acoustical Functional Requirements

Caregiver *access*

- **See and hear patient**
- **Hear vital sign monitor alarms**

Acoustical Criteria for Hospital Patient Rooms

Acoustical Functional Requirements

Patient *privacy*

- **HIPAA -- Health Insurance Portability and Accountability Act**
- **Requires “appropriate physical safeguards” for confidentiality of patient information**

Acoustical Criteria for Hospital Patient Rooms

Acoustical Functional Requirements

Patient *privacy* – health information

- Doctor & Nurse discussions
- Visitor discussions

Central Administrative Station
Hallway conversations
Semi-private room / clinic

Acoustical Criteria for Hospital Patient Rooms

Acoustical Functional Requirements

Room Criteria – ANSI S12.2-1995

- Quiet rest and *sleep*

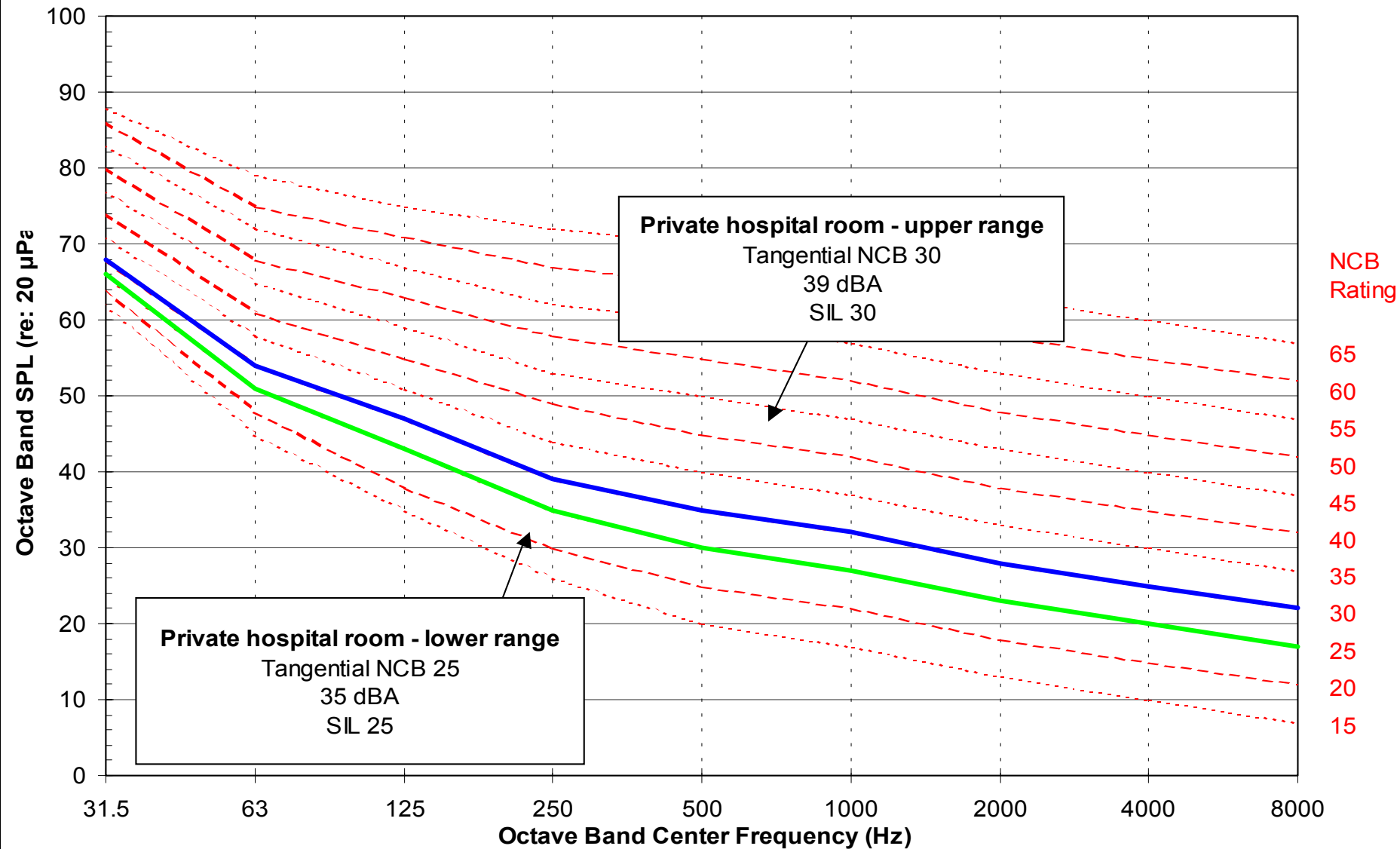
Private Hospital Room

NCB 25 to 30

- Patient *privacy* (based on office)

NCB 35 to 40 – masking noise

Private hospital room (sleep) criteria



Sound Masking Systems -- Acoustical Privacy

Acceptable range of introduced noise

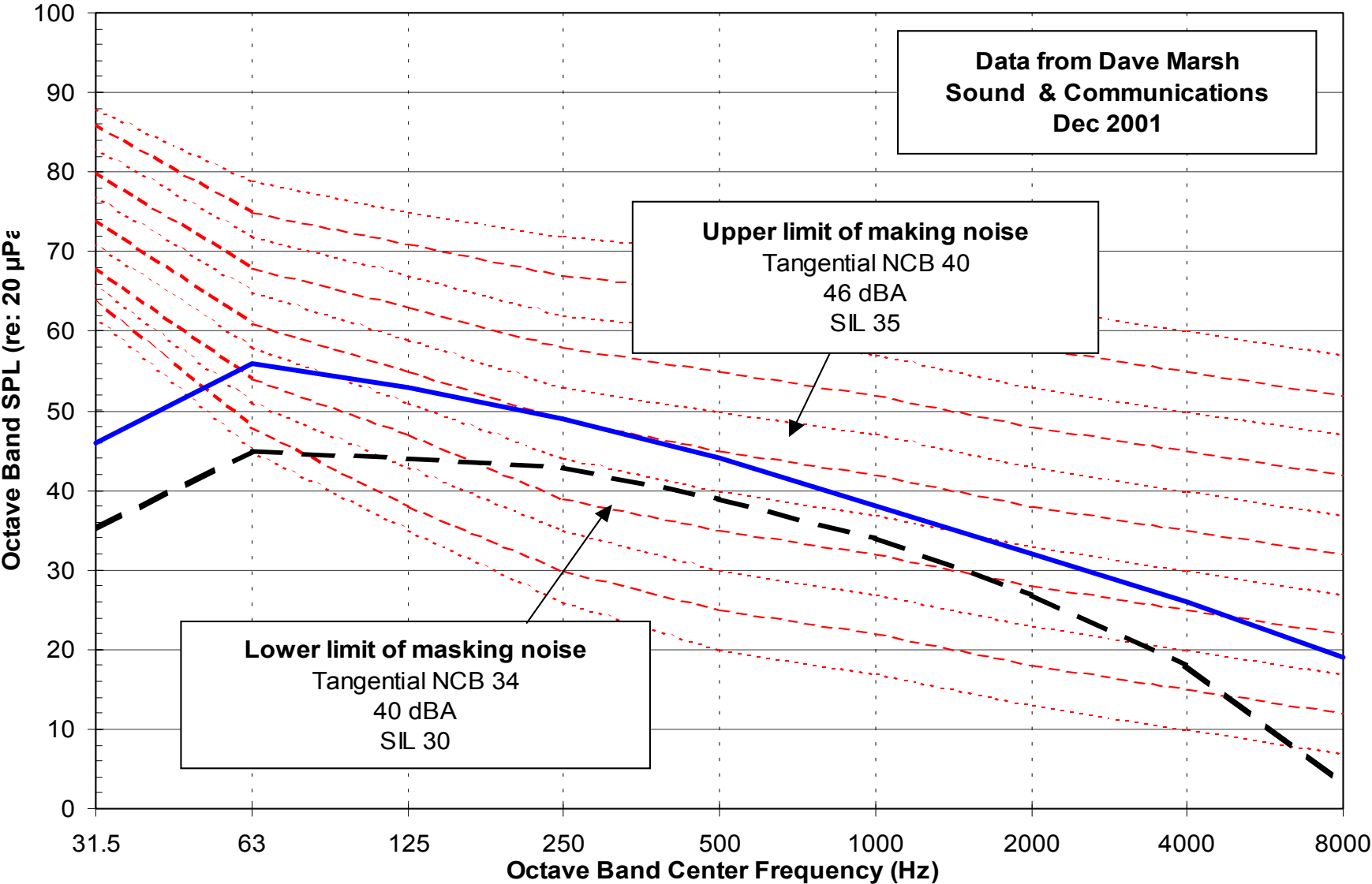
Data from Dave Marsh
Sound & Communications
Dec 2001

Upper limit of making noise
Tangential NCB 40
46 dBA
SIL 35

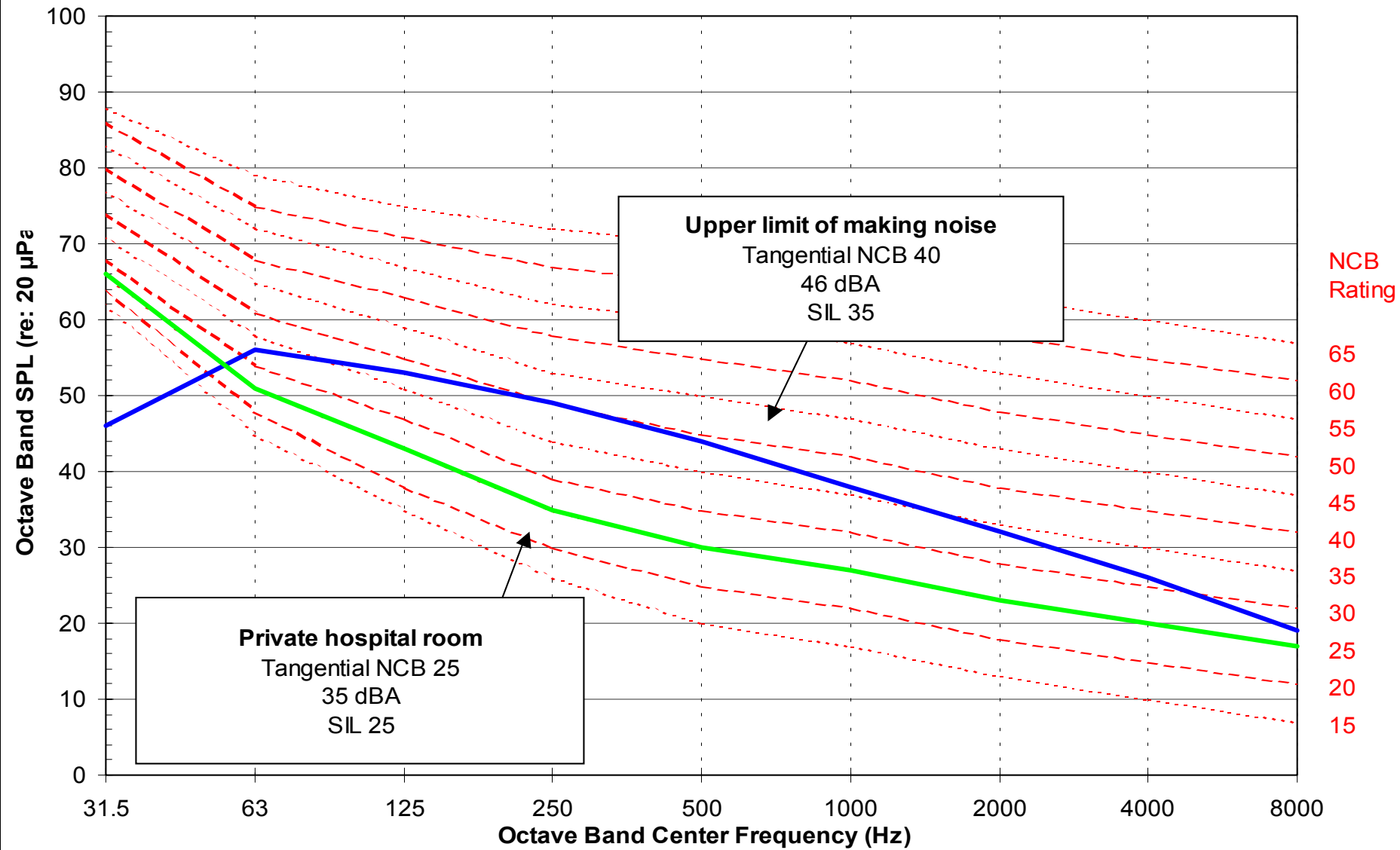
Lower limit of masking noise
Tangential NCB 34
40 dBA
SIL 30

NCB
Rating

65
60
55
50
45
40
35
30
25
20
15



Comparison -- Introduced sound masking v. Private hospital room (sleep) criteria



Acoustical Criteria for Hospital Patient Rooms

Hospital Noise Sources

- **Voices – nurse station & visitors**
 - **Nurse call bells**
 - **Instrument / monitor alarms**
 - **Ringling phones**
 - **Rolling hospital carts**
 - **Office noise – printers, file drawers**
 - **Mechanical systems**
-

Acoustical Criteria for Hospital Patient Rooms

Case Studies – Hospital Noise

- **Inpatient Unit –
“Central Administrative Core”**
- **Patient room – negative pressure
exhaust system**
- **Post Anesthesia Care Unit
HVAC system**









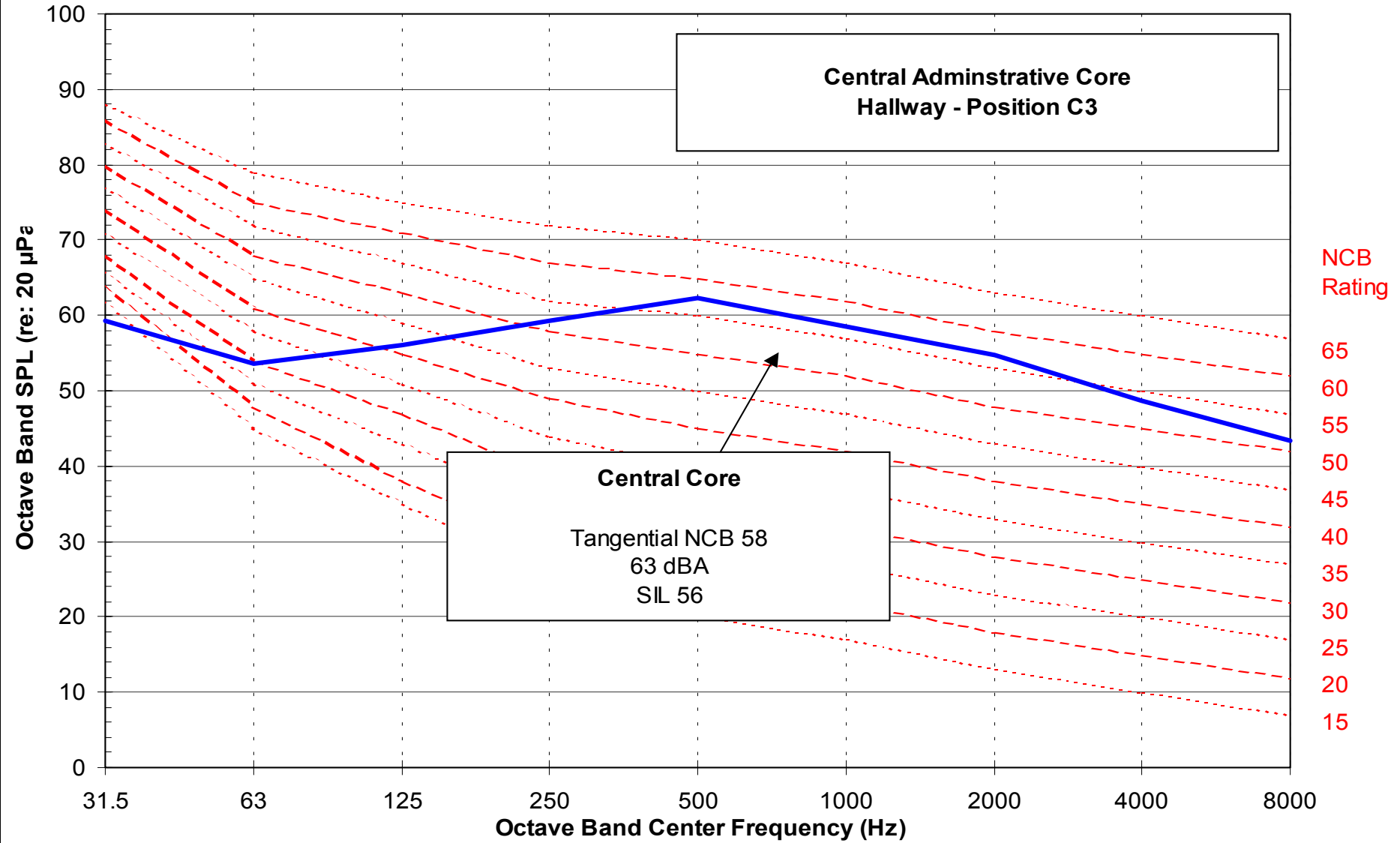




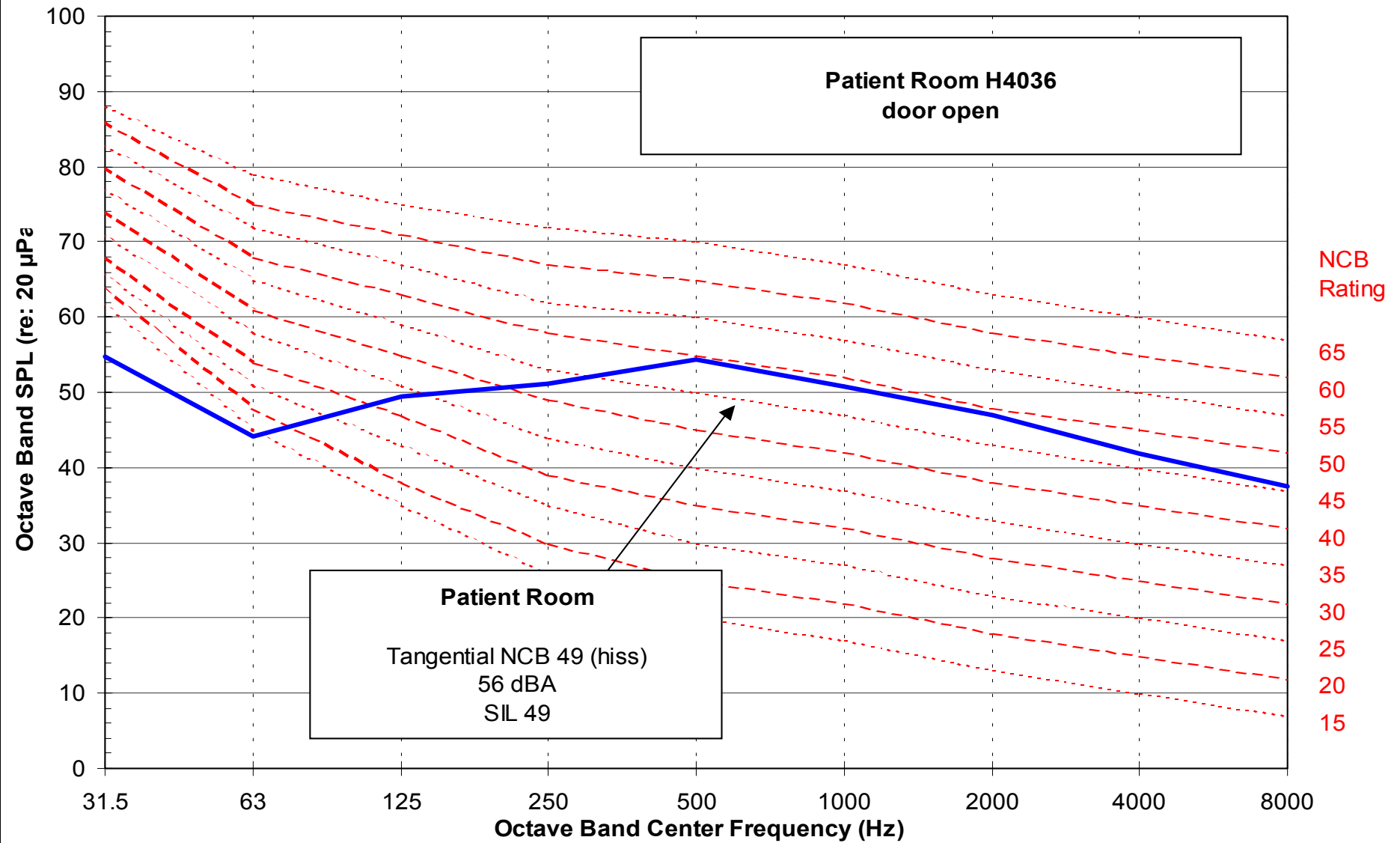




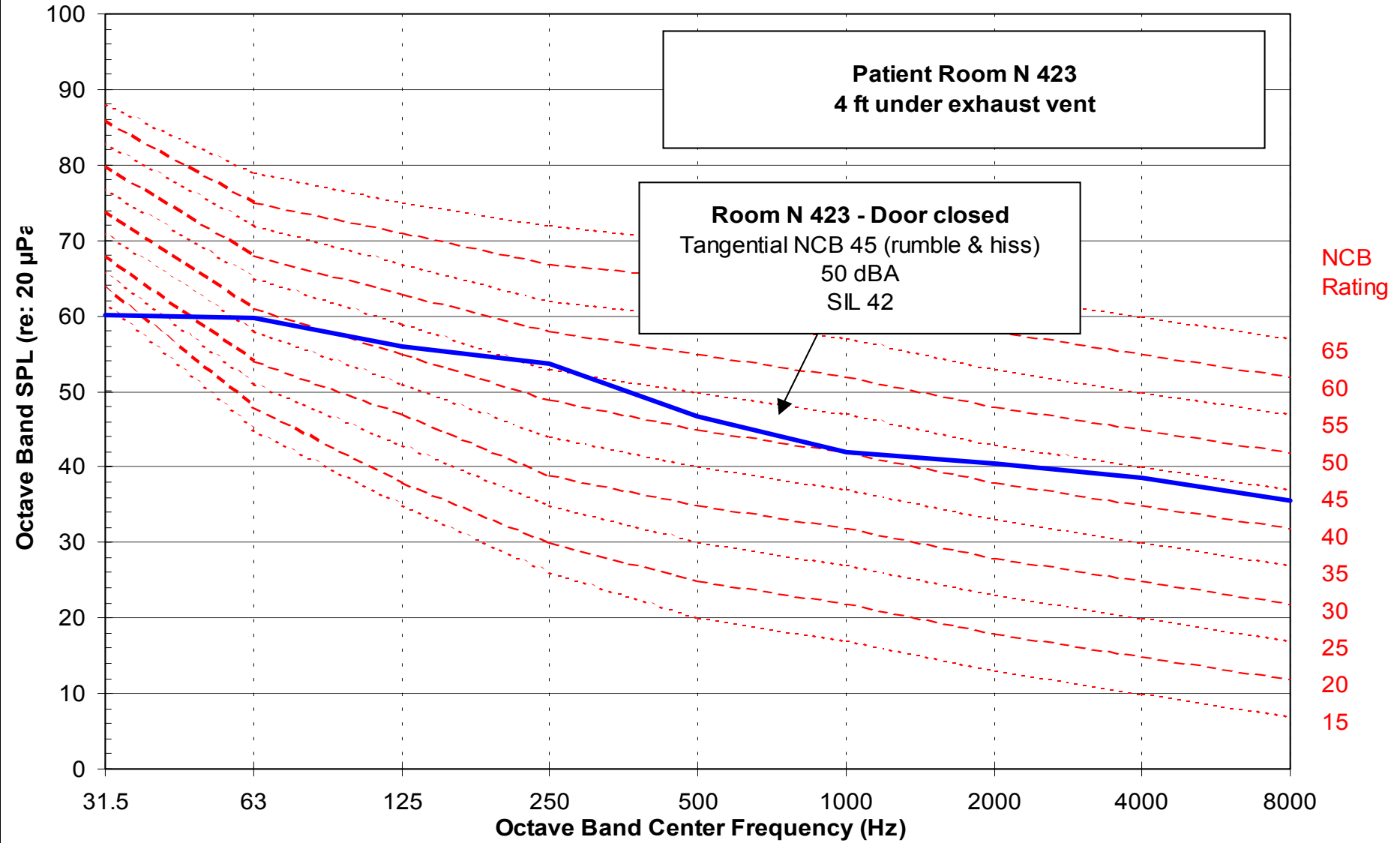
UCONN Health Center - John Dempsey Hospital 4th Floor Inpatient Unit



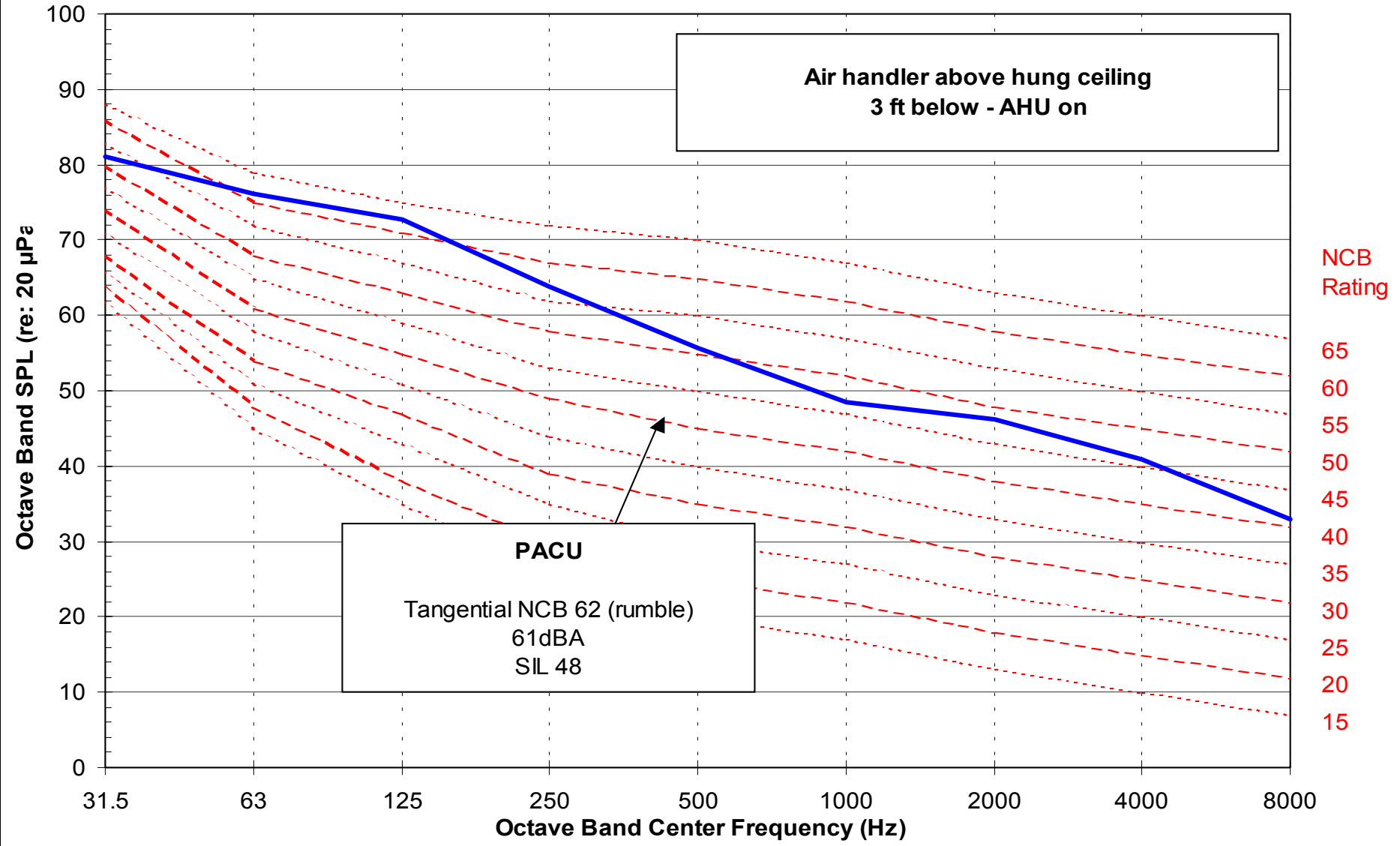
UCONN Health Center - John Dempsey Hospital 4th Floor Inpatient Unit



New Britain General Hospital -- Negative Pressure Rooms Measured Mechanical System Noise



Johnson Memorial Hospital Post Anesthesia Care Unit (PACU)



Solution Strategies

- **Build owner & designer (A/E) awareness of issues**
- **Address early in design
new / renovation**

Solution Strategies

- **Reduce mechanical noise**
- **Reduce room reverberation**
- **Controlled masking system**
 - smart -- day / night variation**
 - targeted -- hallways, stations**
- **Distributed alarm technology**

Future Research Needs

- **Develop architectural response to conflicting design requirements**
- **Quantify / optimize speech interference (masking) for privacy**
- **Develop hospital privacy design criteria**

CONCLUSIONS

- **Early awareness builds project success**
- **Apply good design principles first**
- **Continue research on architectural design and speech privacy**
- **Develop design guidelines**