

Sleepwatching

ASEAN SLEEP TECHNOLOGY NEWSLETTER NEWS / OPINIONS / INSIGHTS



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“Close follow up and continuous education is necessary for a successful treatment.”

–Dr. Rajveer Singh Saren

Interview with Dr. Rajveer on Basics of electronics in Polysomnography

What is a differential amplifier?

It is a specific type of electronic amplifier, which multiplies the difference between two inputs by a common factor called the differential gain. If input at exploring electrode is G1 and at referential electrode is G2, then Output Voltage= $G1 - G2$.

What is the main difference between AC and DC amplifier?

DC amplifiers are used for recording slow-frequency signals (e.g., respiration, pressure, oximetry, respiratory effort), a low filter is not included, although a high-frequency filter is present. AC amplifier is used for recording fast signals and it includes both high and low frequency filter.¹

What is the function of High frequency filter (HFF)?

HFF determines the upper limit of frequencies that a channel will display at full amplitude. HFF is also called Low Pass Filter (LPF).¹

What is the function of Low frequency filter (LFF)?

YLFF determines the lower limit of frequencies that a channel will display at full amplitude. LFF is also called High Pass Filter (HPF).¹

AASM recommended values for HFF and LFF in PSG are²:

Channel	HFF	LFF
EEG	35hz	0.3hz
EOG	35hz	0.3hz
EMG	100hz	10hz
ECG	70hz	0.3hz
AirFlow	15hz	0.1hz
Respiratory effort	15hz	0.1hz

What is Nyquist theorem?

It states that sampling rate must be at least twice the frequency of fastest signal of interest to minimize the distortion of digitized signal.¹

What is frequency aliasing?

A lower sampling rate than twice the frequency of fastest signal results in distortion of original signal, referred to as aliasing.¹

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What are the sampling rates for different PSG channels as recommended by AASM?

Channel ²	Sampling rate ²	
	Max	Min
EEG	500hz	200hz
EOG	500hz	200hz
EMG	500hz	200hz
ECG	500hz	200hz
Snoring	500hz	200hz
Airflow	100hz	25hz
Effort	100hz	25hz
Oximetry	25hz	10hz
Body position	1hz	1hz

What is Common Mode Rejection Ratio (CMRR)?

CMRR measures the ability of amplifier to reject input signals that are common to both inputs. Most amplifiers have CMRR values of 5000 to 10,000. Higher the CMRR, better the amplifier.¹

What is Gain? How does changing Gain affect the signal?

Gain means how many times the amplitude of wave has been multiplied. If we increase gain, amplitude of wave increases and vice versa.¹

What is Sensitivity? How does changing Sensitivity affect the signal?

Sensitivity means no. of microvolts per mm vertically

displayed on channel. Increasing the sensitivity will decrease the amplitude of the wave and vice versa.¹

What is the function of ground lead?

The differential amplifier uses the ground lead as a common reference for all electrodes to do measurements of voltage difference.¹

What is 60Hz filter?

Device used to decrease power line signals obscuring the EEG signals is 60hz filter. It is also called Notch filter.¹

What is Decay time constant and rise time constant?

Decay/Fall Time constant is defined as time in seconds for a square wave to decay to 37% of its original amplitude. Decay time constant performs same function as LFF. A higher LFF results in shorter time constant and vice versa. Rise time constant is defined as time in seconds for signal to attain 63% of its peak amplitude¹

What is ancillary equipment?

The devices attached to PSG machine to obtain additional data are called ancillary equipment eg: capnometer, oximeter, PAP devices, pH meter, esophageal manometry.¹

References: 1. Essentials of Polysomnography. 2nd edn. William H Spriggs. Jones and Bartlet publication.
2. Berry RB etal. AASM scoring Manual of Sleep and Associated events. Version 2.0.3



**Ms.KATINEE
WAE-ASAE**

Registered Nurse & Sleep Technician, Sleep Center of Prince of Songklanagarind university hospital, Thailand

“Becoming a professional sleep tech one need to have a good combination of technical and psychological skills and keep learning continuously”

–Ms.Katinee

Personal opinions of Sleep technologist

Why did you decide to become sleep technologist?

I became a sleep technologist 10yrs ago, prior to which I worked as nurse. The main reason for making this change was that the night shift schedule of sleep tech suited my lifestyle. I thought being a sleep tech would be similar to my role as nurse but later I realized that it involves a very different skill set and knowledge from my last job as nurse. I had to learn a lot about different specialties to become a skillful sleep tech. I keep learning on the job till today.

Under my influence, my wife, who is a Medical Technologist by profession, also became a Sleep

Technologist and now she has been working abroad for more than 10 years.

What is the most challenging aspect of your profession?

Some of the most challenging aspects of this profession are – right hook up and correct analysis of acquired signal following rules. Also every patient is unique and I have to pay attention to their personal details such as age, symptoms, treatment history, and personality to ensure a good sleep study. To become a professional sleep tech one need to have a good combination of technical and psychological skills and keep learning continuously.

What is the biggest change in the profession since you began?

The profession of sleep tech with regular night shifts did not have an adverse effect on my lifestyle rather I find it more manageable. I have also realized the importance of good sleep for my patients, friends, relatives and myself.

What factors do you think affect patient adherence to CPAP?

In my opinion there are 2 major factors which can affect patient adherence to CPAP:

- Patients lack of knowledge of impact of untreated OSA on health and a negative attitude toward CPAP use for the rest of their life. Sleep tech & physician

play a very important role to provide correct information to patient in this regard.

- Lack of good patient management starting from CPAP trial period and follow up services further affect patient adherence to CPAP.

What factors tend to influence patients choice of mask?

In my opinion the following factors influence patient's choice of mask:

- Comfortable well fitted mask.
- Lightweight with good durability, quality and affordable pricing.



DR. DEEPAK SHRIVASTAVA

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Professor of Medicine, Sleep, Pulmonary and Critical Care, UC Davis School of Medicine

Deepak Shrivastava is a Sleep physician in California. He is devoted to medical education and research. Dr. Shrivastava is board certified in Sleep medicine, pulmonary medicine, Critical Care medicine, Internal medicine and Polysomnography technology.

RPSGT Exam Corner – In each issue Dr. Deepak Shrivastava will contribute five questions with answers based on RPSGT exam pattern

1 Which of the following is INCORRECT regarding the desirable EEG sampling rate is 500Hz according to the 2.3 edition of AASM scoring manual?

- A. For EEG, 500Hz sampling rate could improve resolution of spikes in the EEG and better maintain details of the waveform
- B. Capturing 500 data points in one second of time will more accurately represent, or recreate, the analog EEG signal
- C. Once a signal is digitized then it can only be restored to its original analog value if the signal is sampled at a rate of 500Hz
- D. The sampling rate for analog-to-digital conversions must be at least two times the value of the highest frequency of the waveform available to capture, also known as "Nyquist theorem"

2 A disadvantage of piezo-electric effort belts is their?

- A. Invasive nature
- B. Need to interface with an external power source
- C. Tendency to change polarity after large movements
- D. Tendency to pick up EKG artifact

3 According to Center for Disease Control, standard precautions include all of the following except which of the following substances.

- A. Saliva
- B. Sweat
- C. Semen
- D. Urine

4 Which of the following characteristics define mixed apnea?

- A. Reduced airflow followed by a period of no airflow
- B. No airflow followed by a period of reduced airflow
- C. A period of effort followed by a lack of effort with no airflow throughout
- D. No effort followed by resumption of effort, with no airflow throughout

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A patient with COPD is on Beta-blocker and theophylline therapy. Which of the following polysomnographic findings should be expected?

- A. Increased sleep onset latency and frequent awakenings
- B. Increased slow wave sleep and frequent nightmares
- C. Decreased slow wave sleep and decreased REM latency
- D. Decreased sleep onset latency and alpha delta sleep

ANSWERS

Question 1:

Answer is C. A signal can be digitized and then restored to its original analog value if the signal is sampled at twice the highest frequency contained in the signal. All other choices are correct.

Reference: Analog. In: Tech terms dictionary [Internet]. Available at <http://www.techterms.com/definition/analog>. The AASM manual for the scoring of sleep and associated events: rules, terminology and technical specifications. Westchester, Ill: American Academy of Sleep Medicine; 2007. p. 19-20.

Question 2:

Answer is C. Piezo bands sometimes falsely indicate paradoxical or out of phase efforts if one of the bands reverses its polarity after a gross body movement.

Reference: Atlas of clinical polysomnography, Vol. 2, (p. 189).

Question 3:

Answer is B. Standard precautions apply to all body fluids, secretions, and excretions except sweat.

Reference: http://www.cdc.gov/ncidod/hip/ISOLAT/std_prec_excerpt.htm

Question 4:

Answer is D. An apnea by definition is no airflow, which rules out choices A and B. The central component, indicated by an absence of respiratory effort, precedes the resumption of effort, which, in the continued absence of airflow, is the obstructive component of the apnea.

Reference: Berry R.B. (2002), Sleep medicine pearls (2nd ed.), (p.69)

Question 5:

Answer is A. Beta-blockers may cause difficulty in initiating and maintaining sleep as well as frequent awakenings and nightmares. Theophylline may contribute to insomnia.

Reference: Chokroverty S. (2002). Clinical companion to sleep disorders medicine (2nd ed.) (pp. 157-158)

Events in the region and world Jan – Jun 2017

4th ASEAN Sleep Congress, Manila, Philippines, www.asiansleep.org/latest%20news/news_text.php?news_id=12	7-10 March 2017
Bangkok International CBT-I Workshop 2017, Bangkok, Thailand www.imcpcthailand.com/sleep2017	15 – 17 March 2017
ATS 2017, Washington DC, US www.conference.thoracic.org	19-24 May 2017
Sleep 2017, Boston, US, www.aasmnet.org/annualmeeting.aspx	3-7 June 2017
Chest Congress 2017, Basel, Switzerland, www.chestswitzerland2017.org/congress.html	7-9 June 2017

Sleep watching past issues

To access the past issues of sleep watching, please go to the below webpage
www.philips.com.sg/healthcare-consumer/sleep-apnea/resources#sleep-physicians-newsletters

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