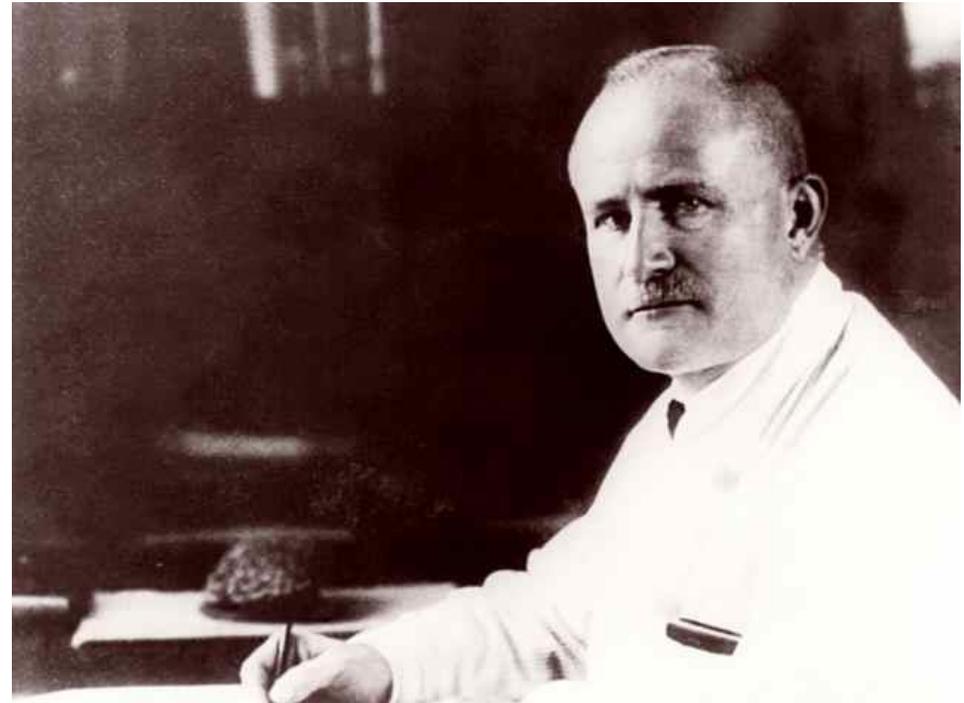
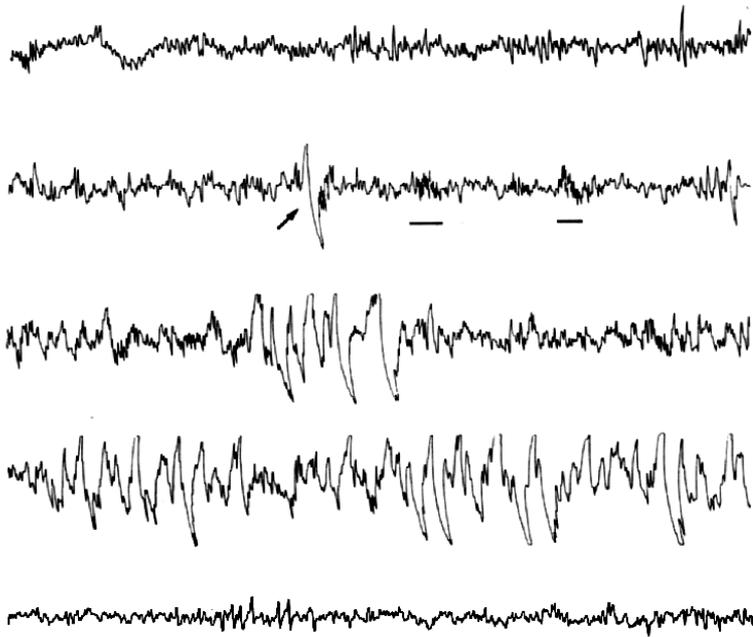


Polisonnografia. Principi e Interpretazione.

Giuseppe Plazzi



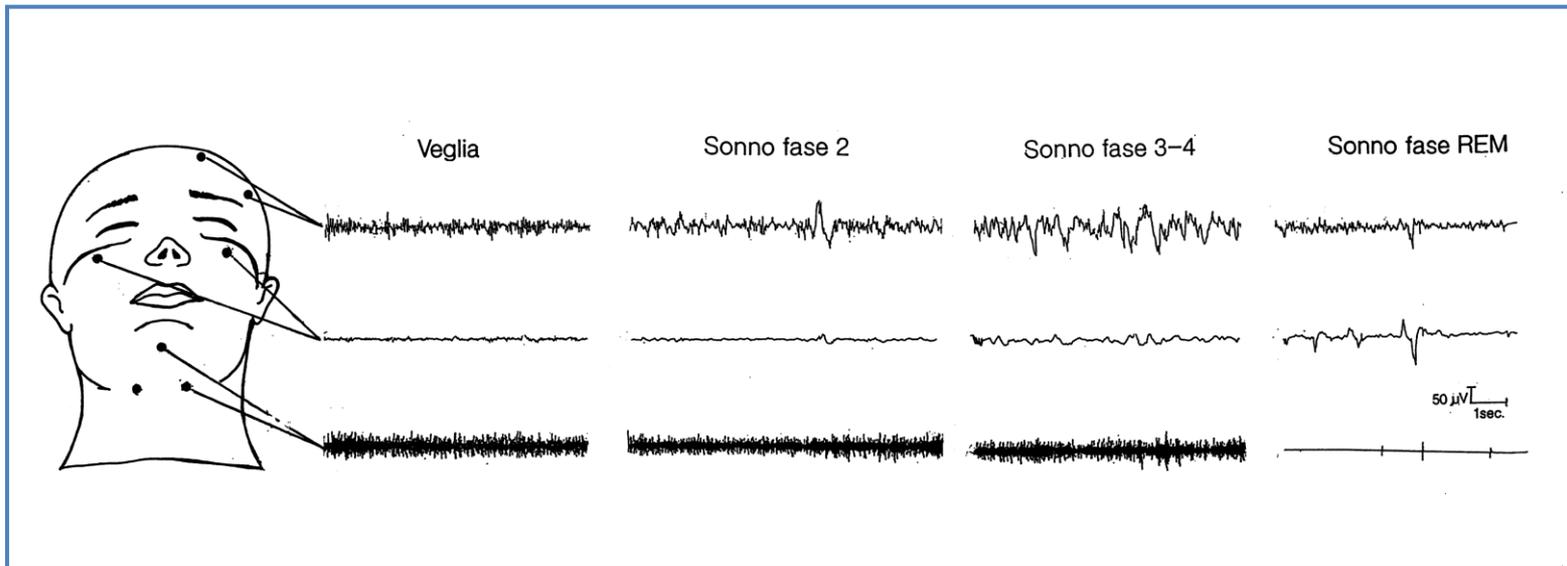
Hans Berger 1873-1941



Alfred Lee Loomis 1887-1975



Nathaniel Kleitman 1895-1999

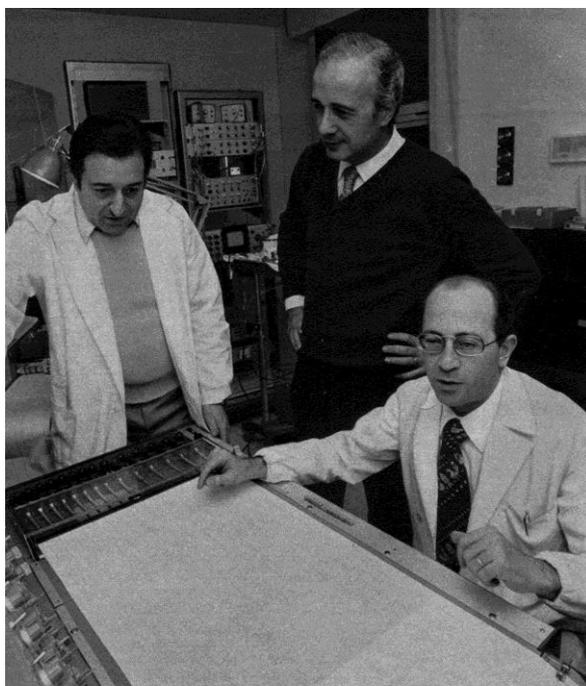




Etude polygraphique des manifestations épisodiques
(hypnique et respiratoires), diurnes et nocturnes,
du syndrome de Pickwick

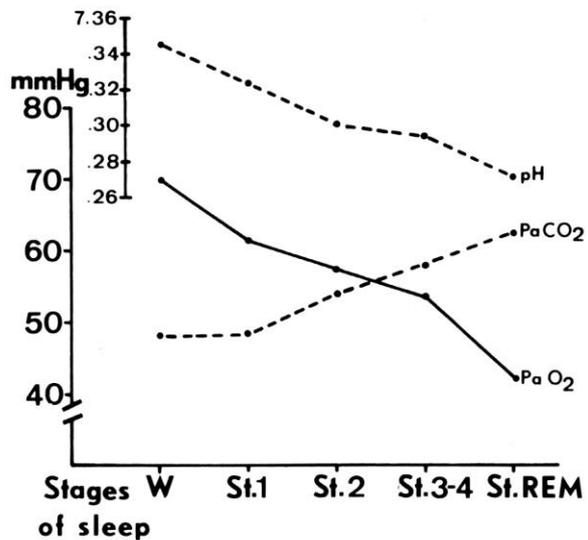
H. Gastaut, C.A. Tassinari and B. Duron

Rev. Neurol. 1965

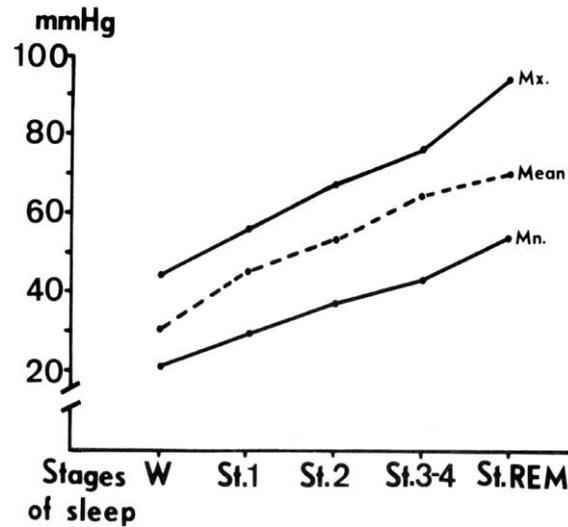


Laboratorio del sonno dell'Università di Bologna. Da sinistra, il tecnico Piero Pollini, il professor Elio Lugaresi e il professor Giorgio Cocagna studiano un tracciato elettroencefalografico.

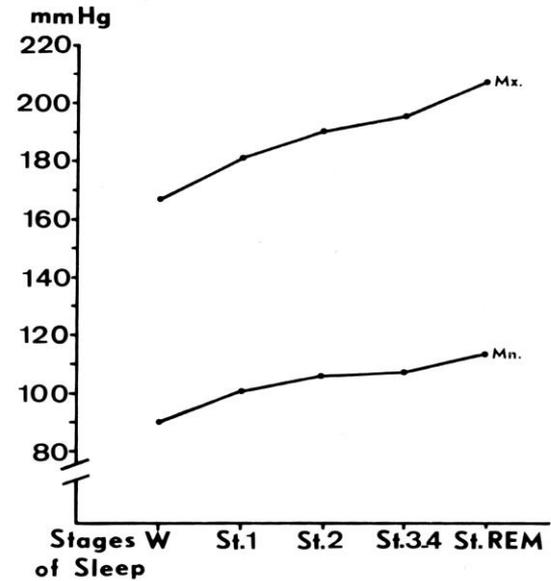
Gas analysis Values



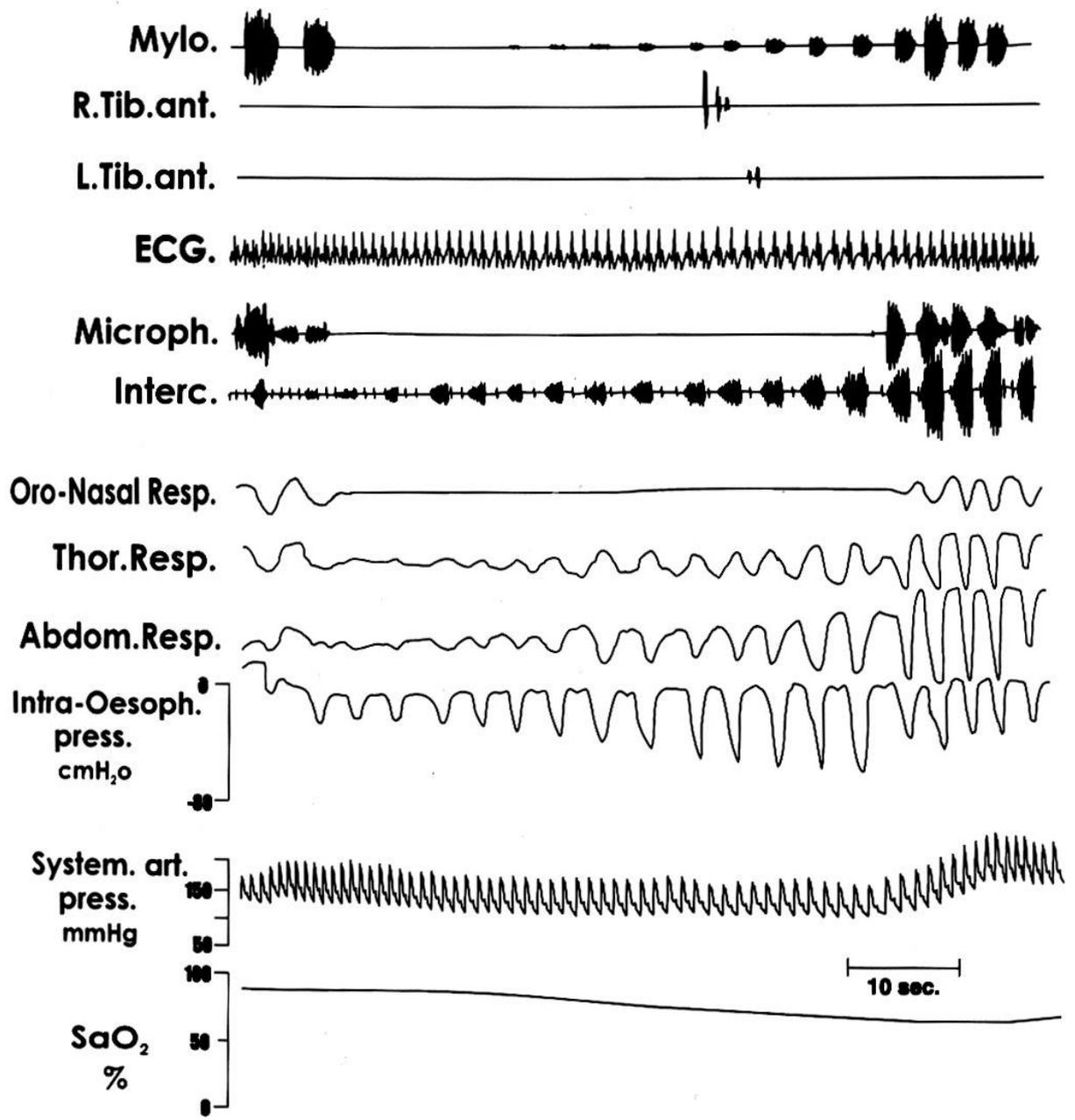
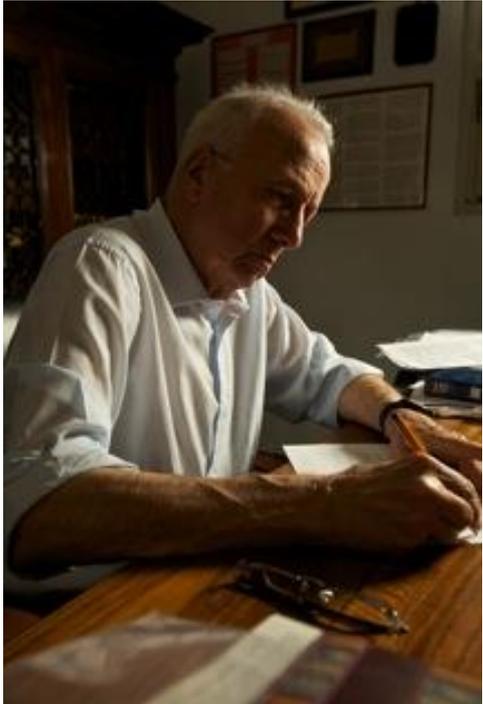
Pulmonary Artery Pressure



Systemic Arterial Pressure







**A MANUAL OF STANDARDIZED TERMINOLOGY, TECHNIQUES
AND SCORING SYSTEM FOR SLEEP STAGES OF HUMAN SUBJECTS**

Attila Rechtschaffen and Anthony Kales; Editors

**U.S. Department of Health, Education, and Welfare
Public Health Service - National Institutes of Health
National Institute of Neurological Diseases and Blindness
Neurological Information Network
Bethesda, Maryland, 20014**

1968



Polisonnografia

- La Polisonnografia permette di osservare simultaneamente eventi che si verificano in diversi sistemi fisiologici, durante diversi stati neurofisiologici.
- L'utilità diagnostica risiede nella possibilità di correlare modificazioni specifiche di uno o più parametri fisiologici con condizioni specifiche definite da altri parametri (ad es. aritmia cardiaca e apnea, ecc.).

Metodiche standardizzate per valutare i disturbi del sonno

Polisonnografia notturna in laboratorio (PSG standard)

Test delle Latenze Multiple al Sonno (MSLT)

Test di Mantenimento della Vigilanza (MWT)

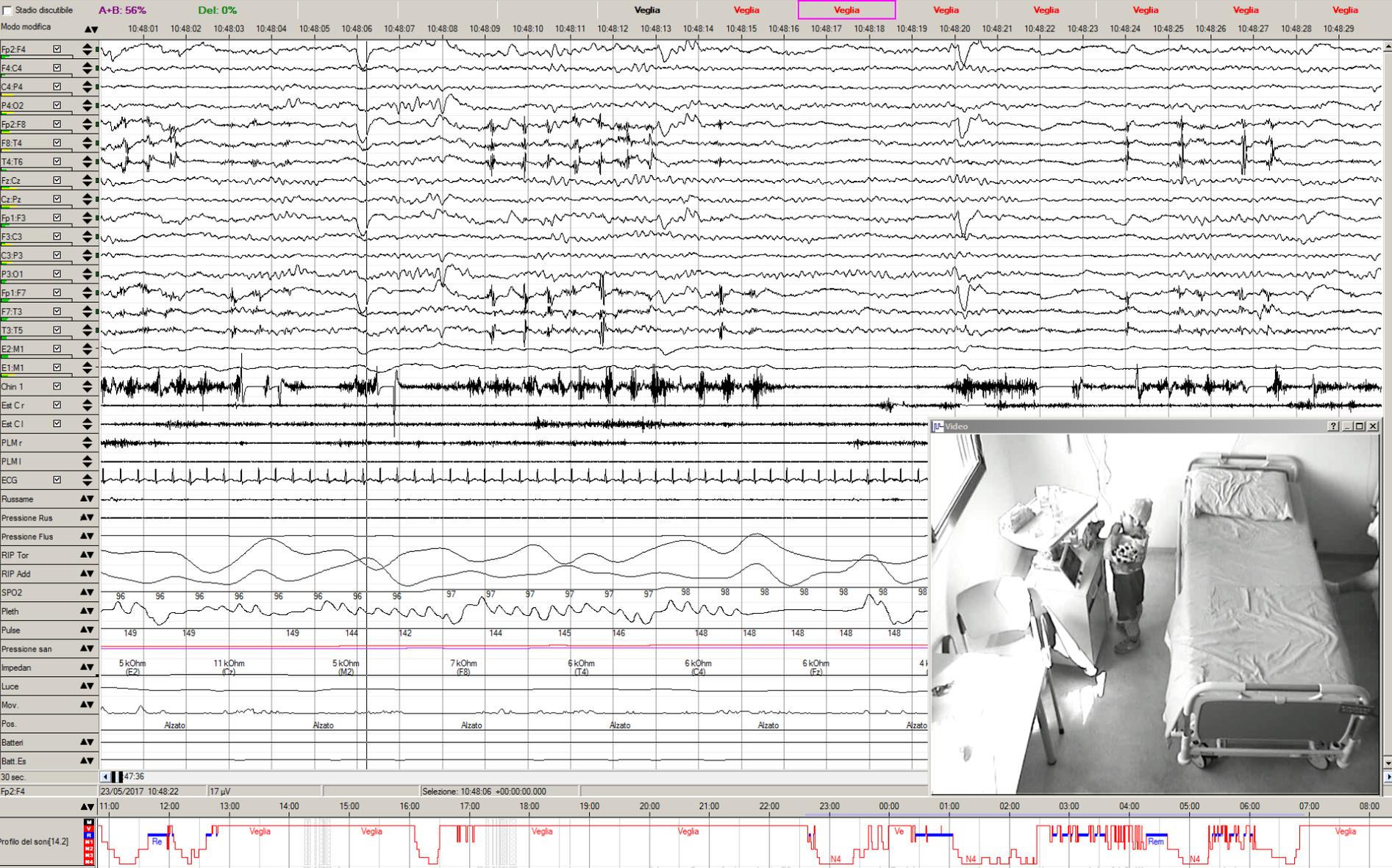
Video PSG

EEG + PSG. Nel sospetto di episodi critici

Monitoraggi Ambulatoriali (completo, cardiorespiratorio)

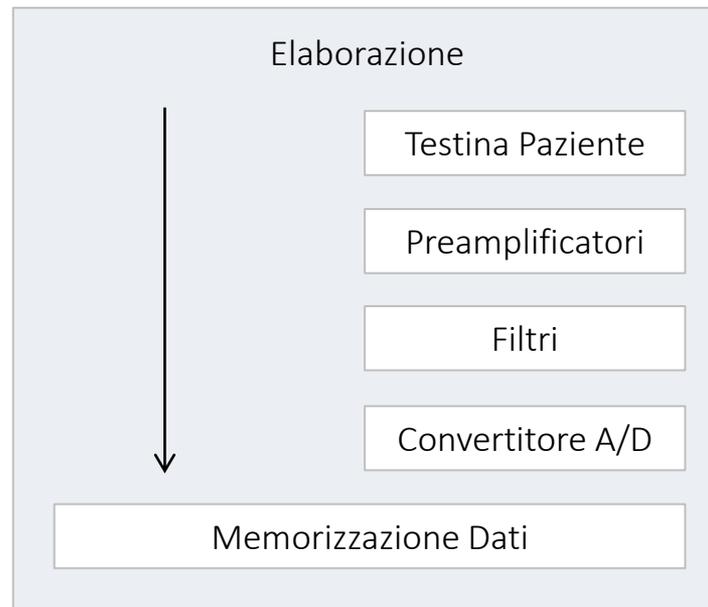
Actigrafia

Video Polisonnografia



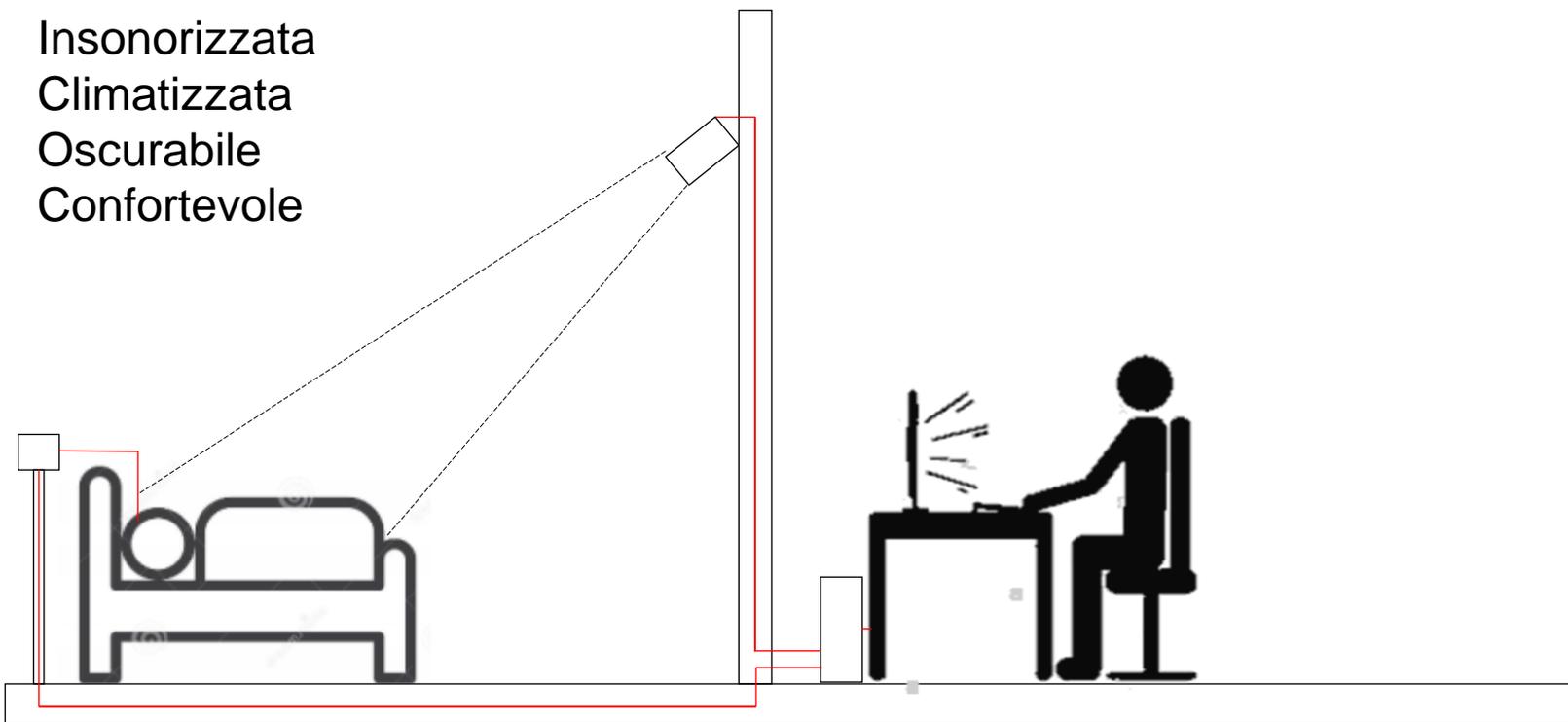


- Quali strumenti
- Come Impostarli
- Come dove applicare i sensori
- Come acquisire i dati
- Come visualizzare i dati

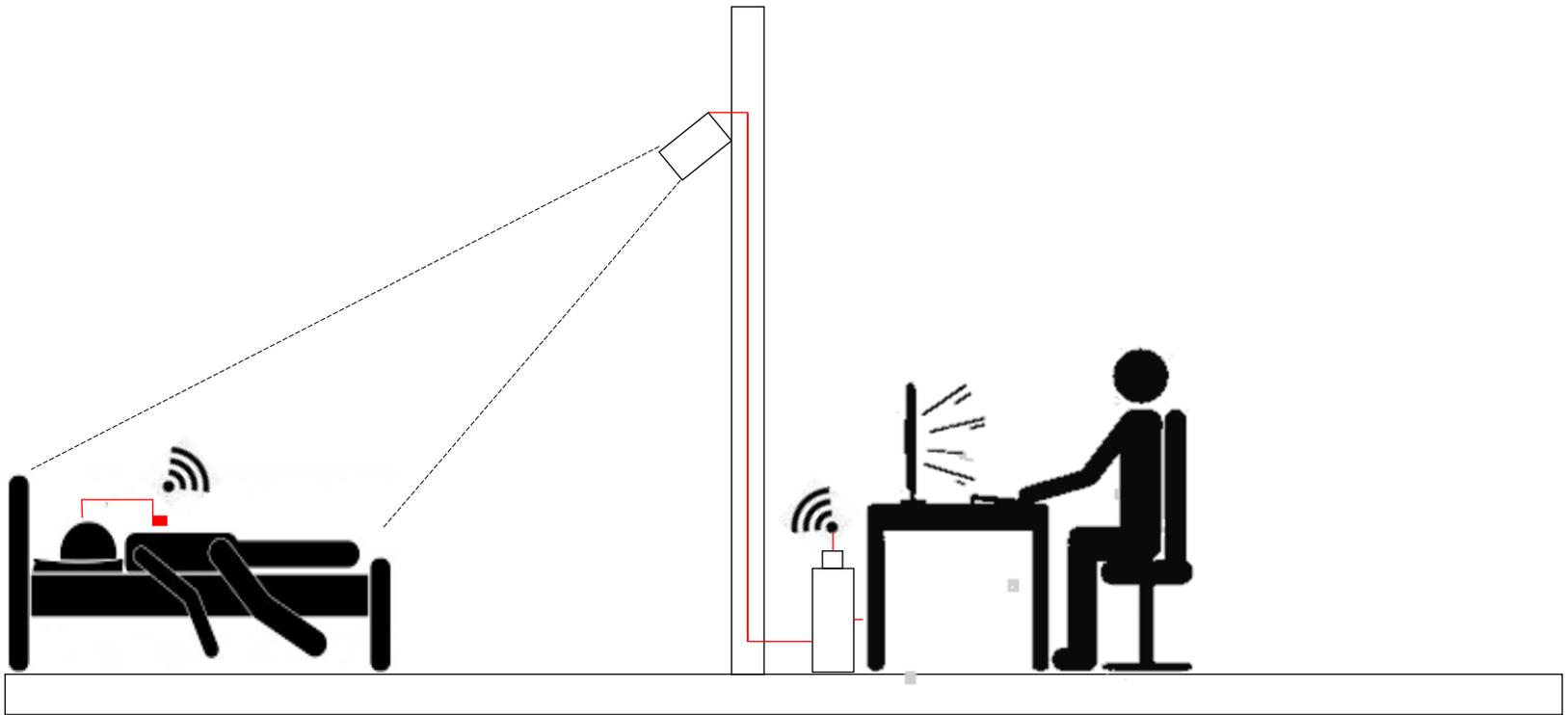


Video Polisonnografia Stanziale

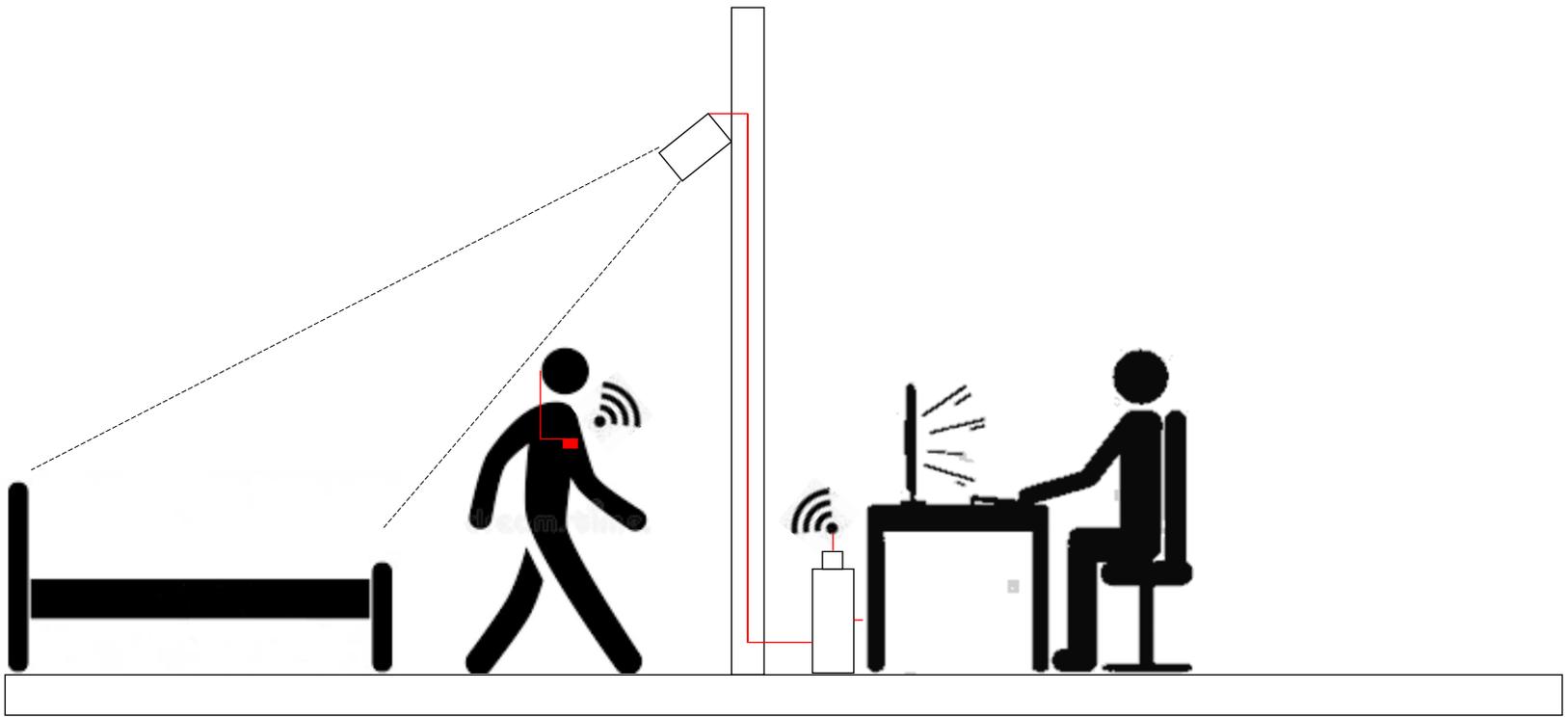
Insonorizzata
Climatizzata
Oscurabile
Confortevole



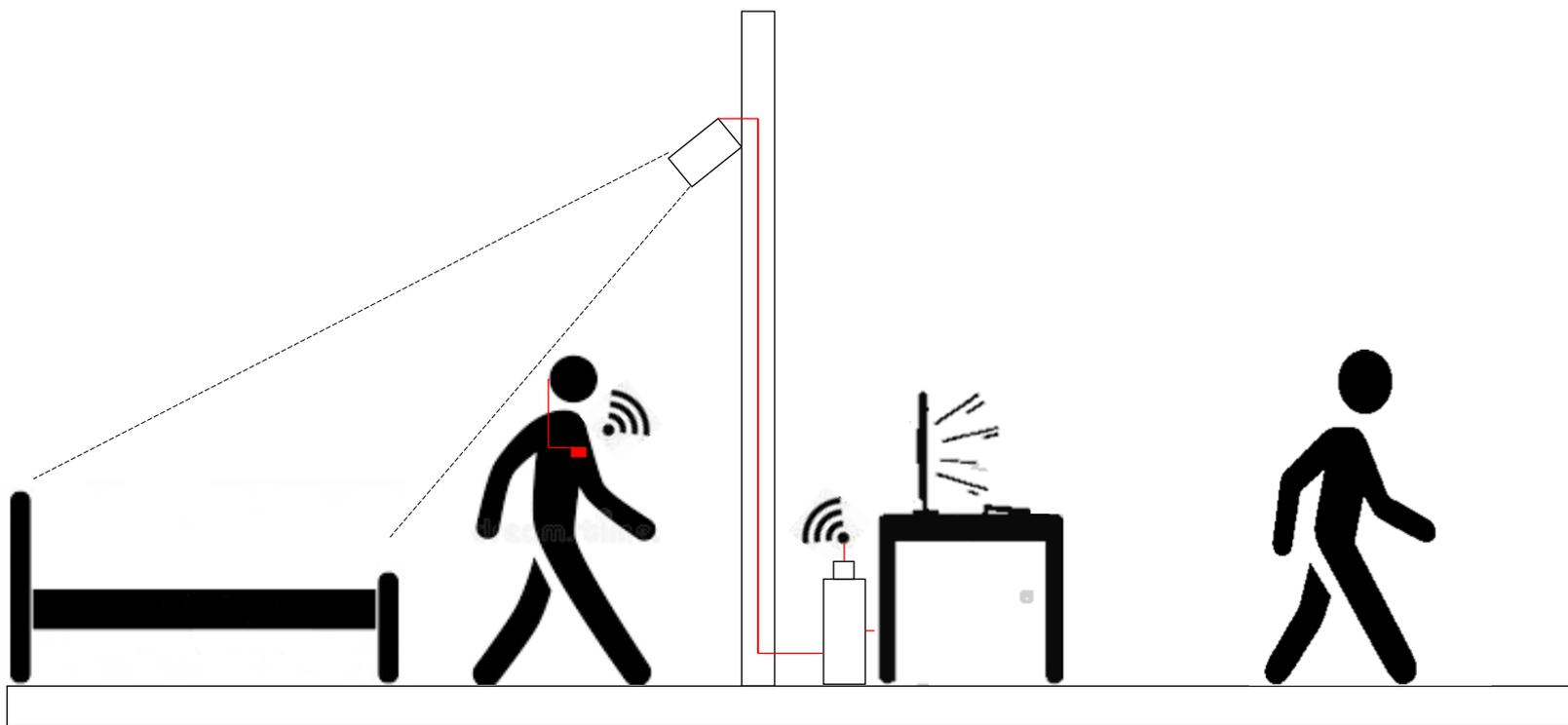
Video Polissonografia Telemetria



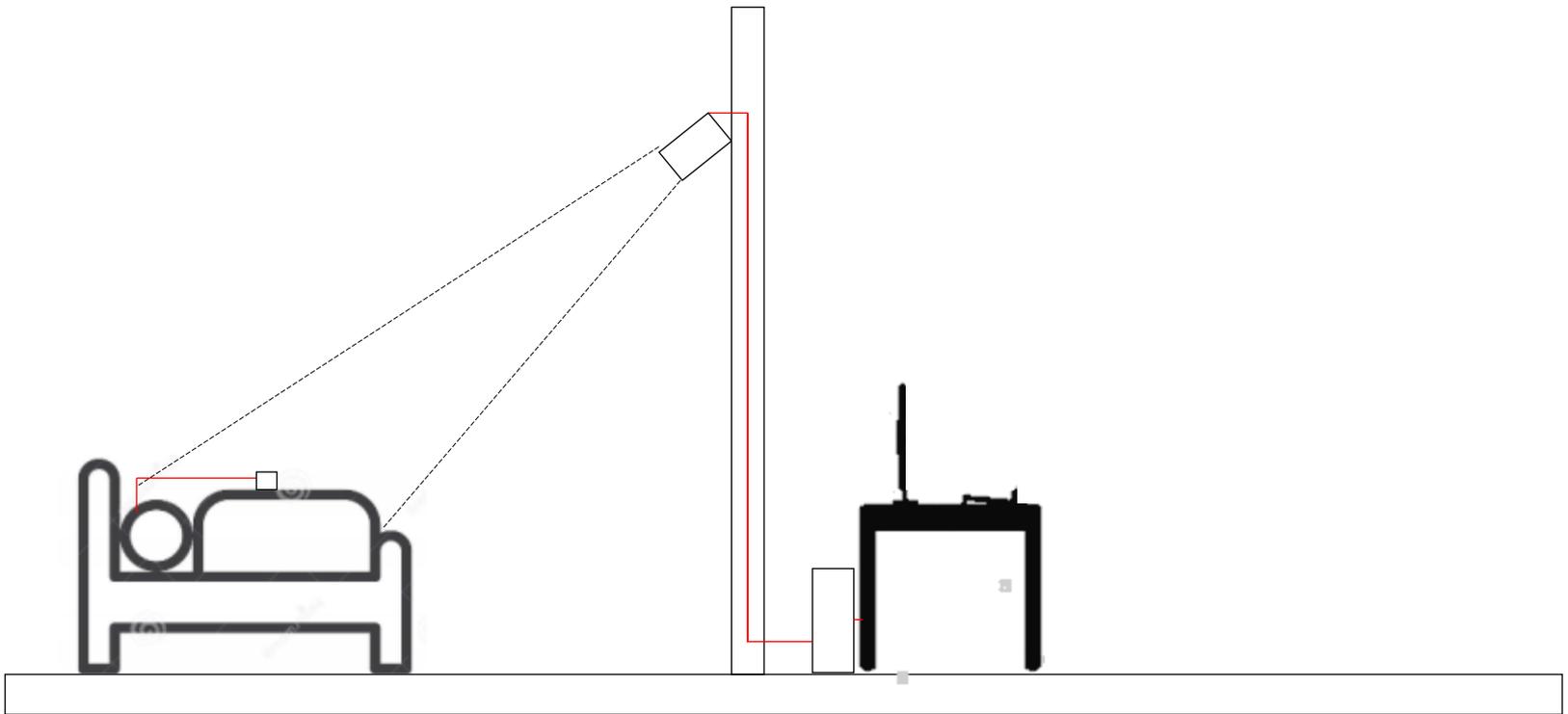
Video Polissonnografia Telemetria



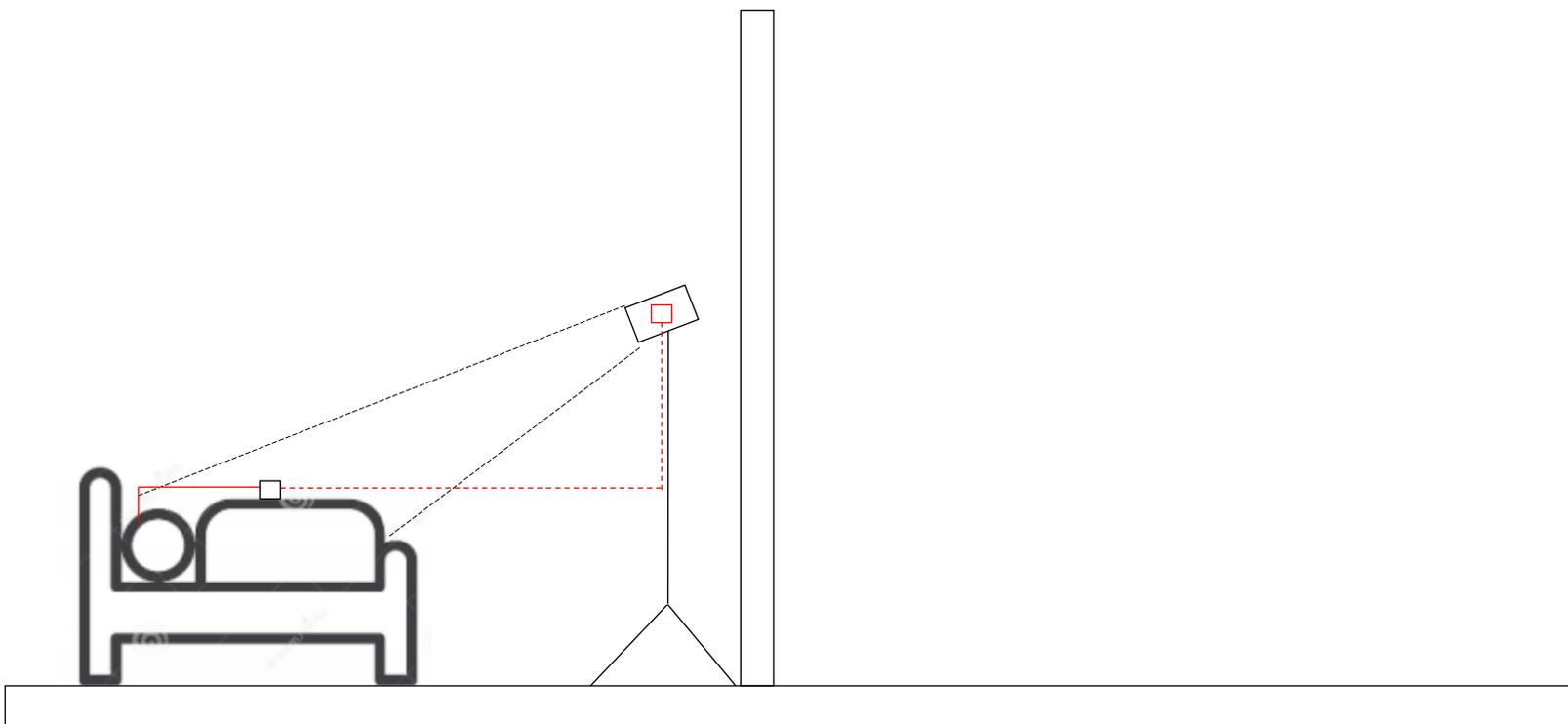
Video Polissonografia Telemetria



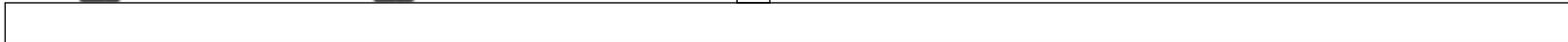
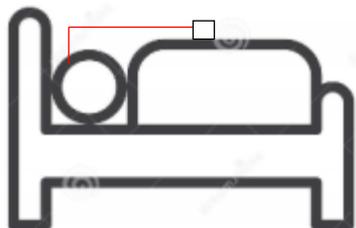
Video Polissonografia Ibrida



Video Polisonnografia Domiciliare

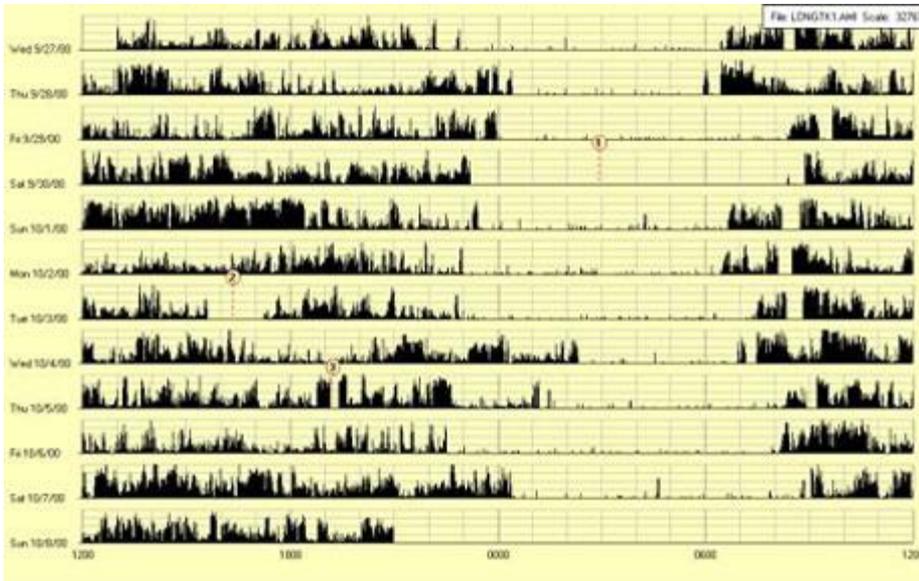


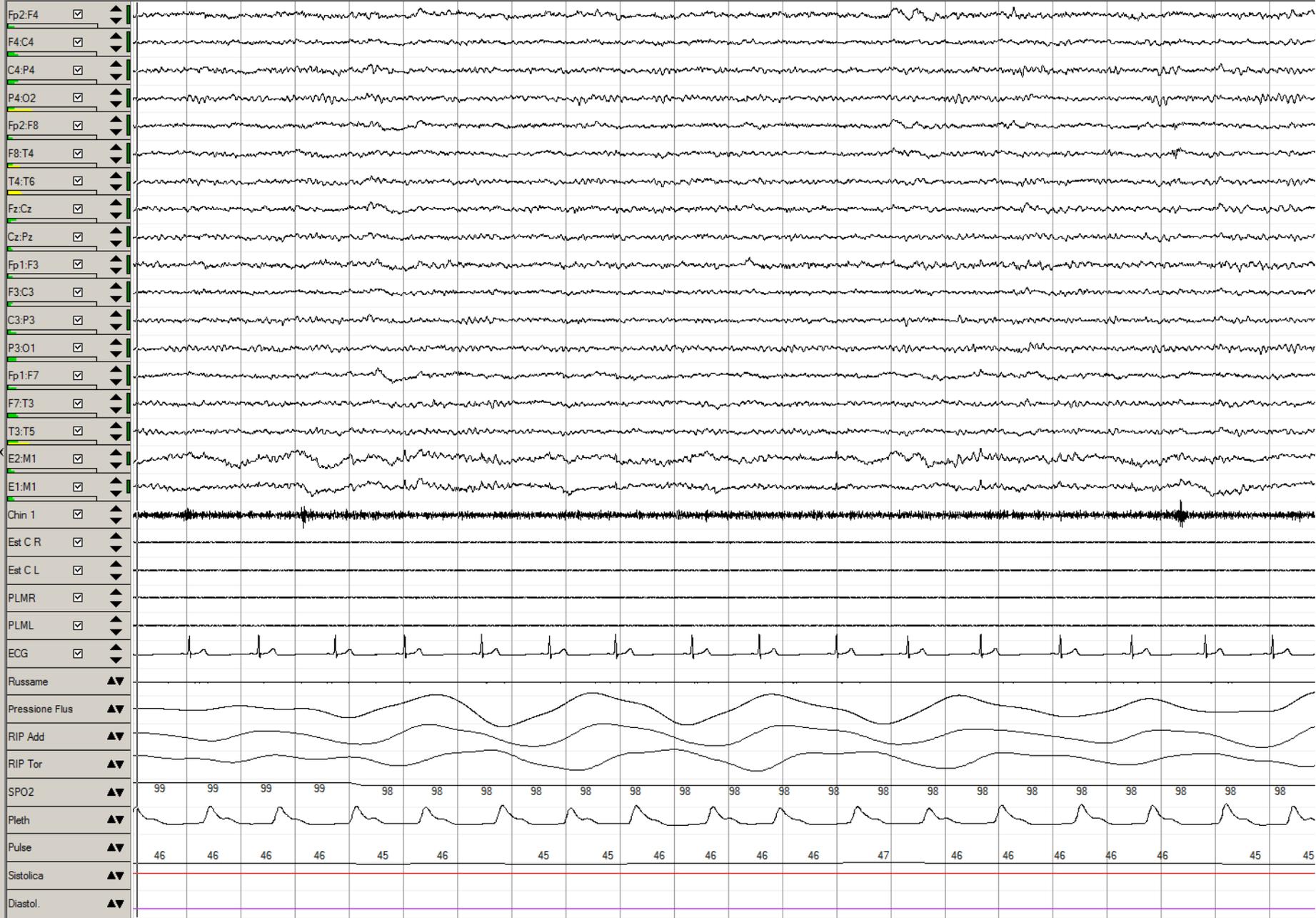
Polisonnografia Dinamica (p. completa o monitoraggio cardiorespiratorio)

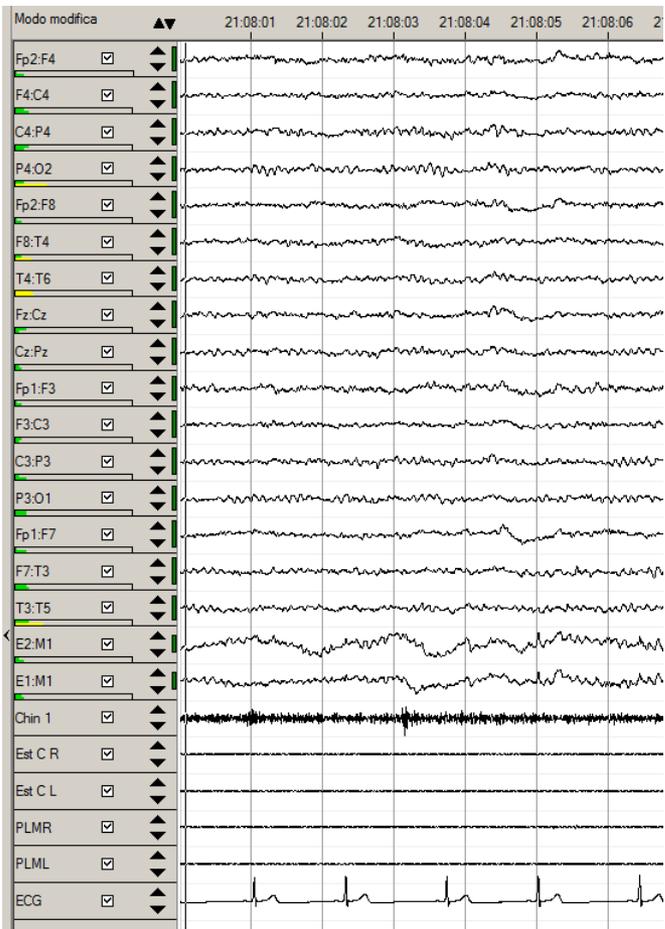


Actigrafo (oligografia)

L'actigrafo è uno strumento che consente di registrare il numero di movimenti corporei in forma di accelerazione, permettendo l'analisi dell'attività e l'analisi del sonno sui dati registrati



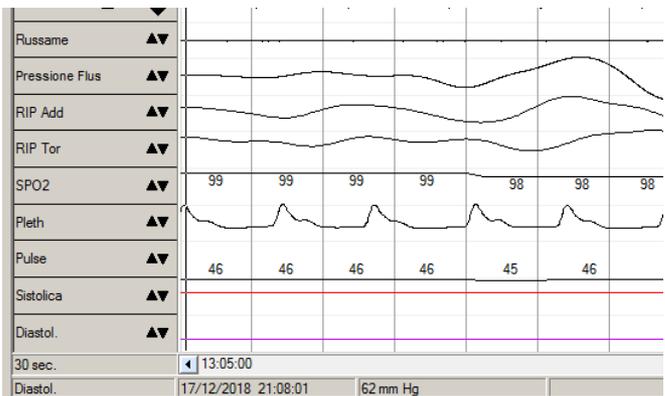




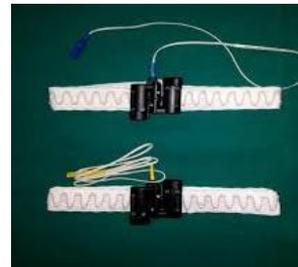
Differenza di Potenziale



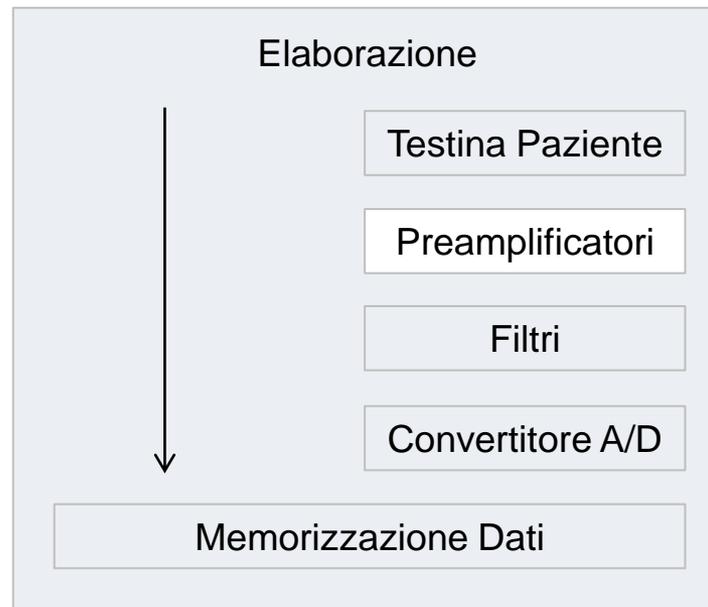
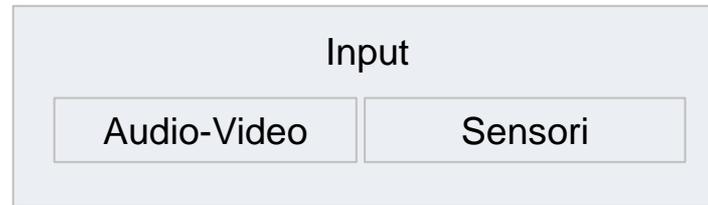
- EEG
- EOG
- EMG
- ECG

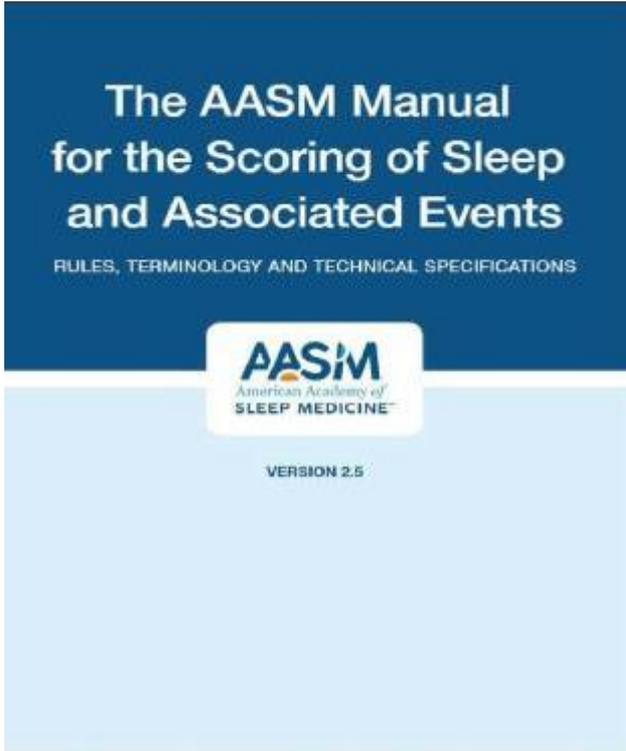


Altra Grandezza Fisica









1. SPECIFICATIONS

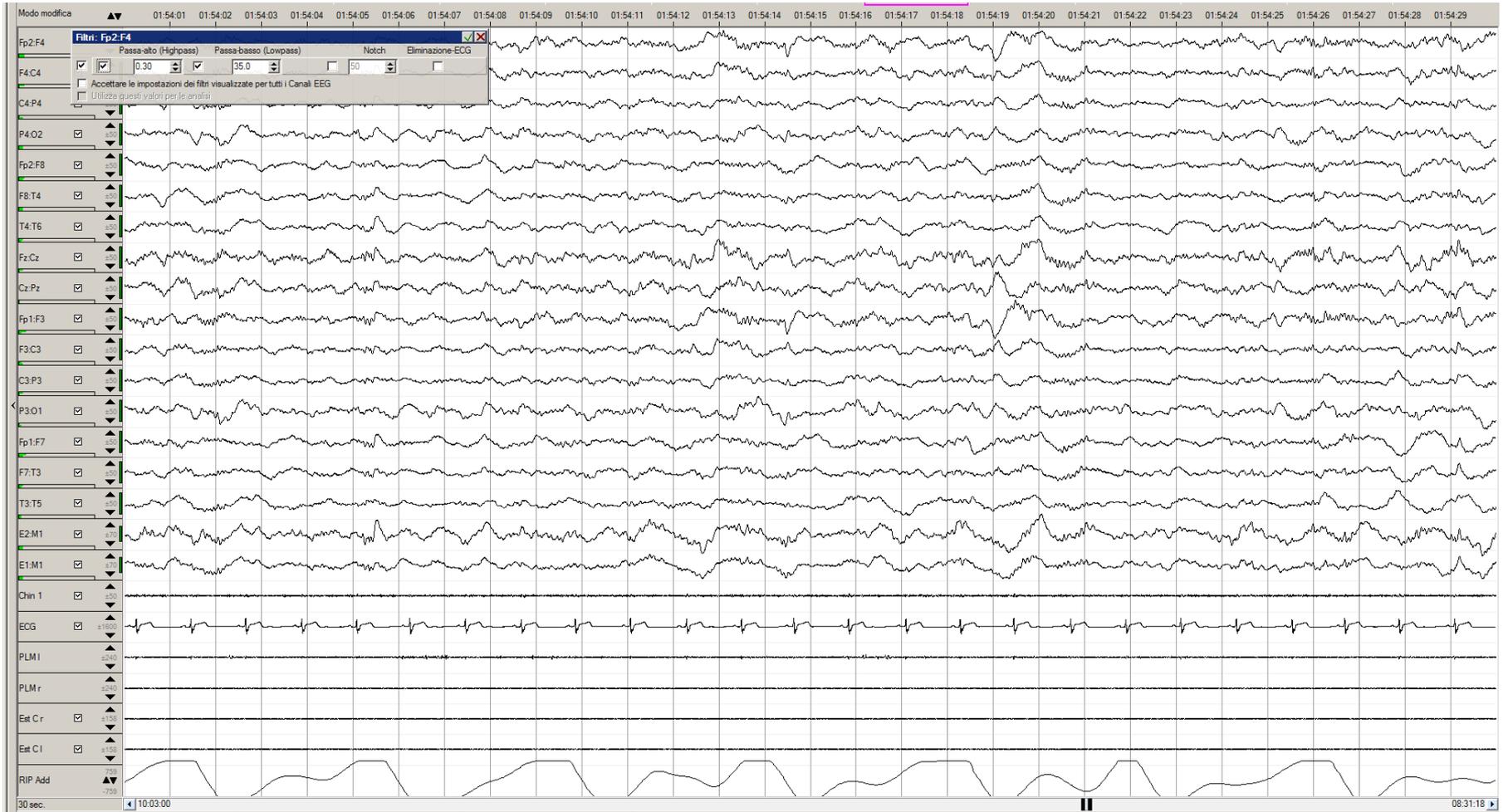
A. Digital Specifications for Routine PSG Recordings (Notes)

[RECOMMENDED]

Maximum Electrode Impedances		5 K Ω ¹
Minimum Digital Resolution		12 bits per sample
Sampling Rates	Desirable	Minimal
EEG	500 Hz ²	200 Hz ³
EOG	500 Hz ⁴	200 Hz
EMG	500 Hz ⁵	200 Hz
ECG	500 Hz ⁶	200 Hz
Airflow	100 Hz	25 Hz
Oximetry	25 Hz ⁷	10 Hz
Nasal Pressure	100 Hz ⁸	25 Hz
Esophageal Pressure	100 Hz	25 Hz
Body Position	1 Hz	1 Hz
Snoring Sounds	500 Hz ⁹	200 Hz
Rib Cage and Abdominal Movements	100 Hz ¹⁰	25 Hz
Routinely Recorded Filter Settings	Low Frequency Filter	High Frequency Filter¹¹
EEG	0.3 Hz	35 Hz ³
EOG	0.3 Hz	35 Hz
EMG	10 Hz ⁵	100 Hz ⁵
ECG	0.3 Hz ¹²	70 Hz
Respiration	0.1 Hz	15 Hz
Snoring	10 Hz	100 Hz

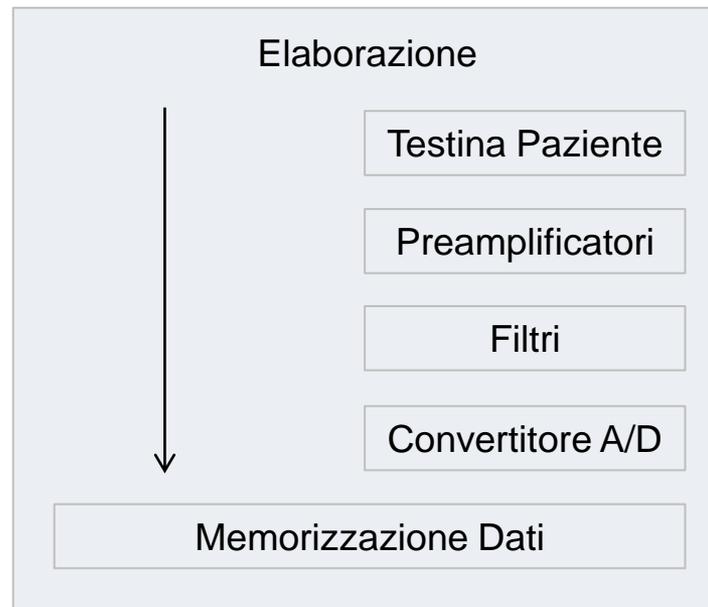
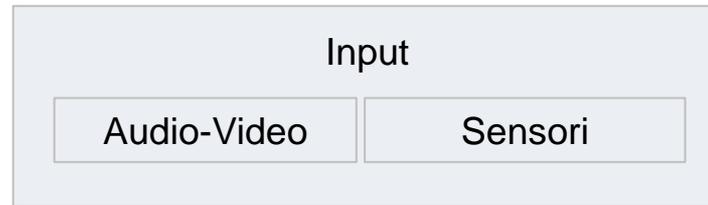
Range di visualizzazione dei principali parametri Polisonnografici

Impostazione Corretta



Impostazione Sbagliata





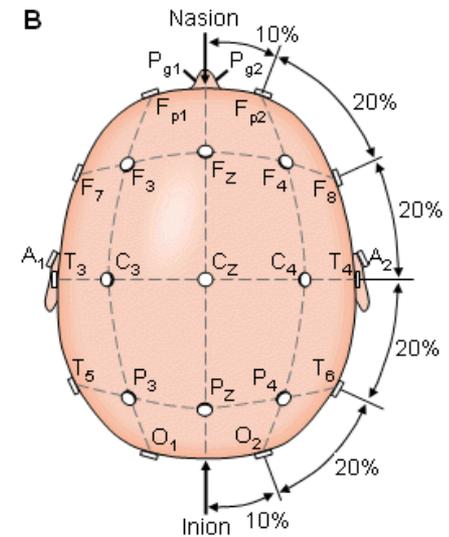
A MANUAL OF STANDARDIZED TERMINOLOGY, TECNIQUE AND SCORING SYSTEM FOR SLEEP STAGES OF HUMAN SUBJECTS

Allan Rechtschaffen e Antony Kales, editori. 1968

Brain Information Service/Brain Research Institute
University of California
Los Angeles, California 90024

Stage W (wakefulness)	C3-A2
Movement Time (MT)	O2-A1
Stage 1	Cz-A1
Stage 2	EOGr-A1
Stage 3	EOGI-A1
Stage 4	EMG sm
Stage NREM (non REM) (1+2+3+4)	ECG
Stage REM	

EPOCHE 30 secondi



The AASM Manual for the Scoring of Sleep and Associated Events

Rules, Terminology and Technical Specifications



CONRAD IBER, MD, SONIA ANCOLI-ISRAEL, PhD, ANDREW L. CHESNON JR., MD AND
STUART F. QUAN, MD FOR THE AMERICAN ACADEMY OF SLEEP MEDICINE

AMERICAN ACADEMY OF SLEEP MEDICINE, WESTCHESTER, IL

AASM Manual for Scoring Sleep, 2007

A. Stages of Sleep

- 1) The following terminology is recommended for the stages of sleep:
 - a. Stage W (Wakefulness)
 - b. Stage N1 (NREM 1)
 - c. Stage N2 (NREM 2)
 - d. Stage N3 (NREM 3)
 - e. Stage R (REM)

Note: Stage N3 represents slow wave sleep and replaces the R & K nomenclature of stage 3 and stage 4 sleep.

VISUAL RULES FOR ADULTS

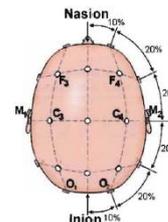
1. TECHNICAL SPECIFICATIONS

A. Electroencephalogram (EEG)

- 1) The recommended derivations are:
 - a. F₇-M₁
 - b. C₃-M₁
 - c. O₁-M₁

[RECOMMENDED]

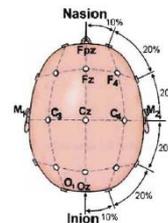
Backup electrodes should be placed at F₇, C₃, O₁ and M₁ to allow display of F₇-M₂, C₃-M₂ and O₁-M₂ if electrodes malfunction during the study.



- 2) Alternative acceptable derivations are:
 - a. F₇-C₃
 - b. C₃-O₁
 - c. C₃-M₁

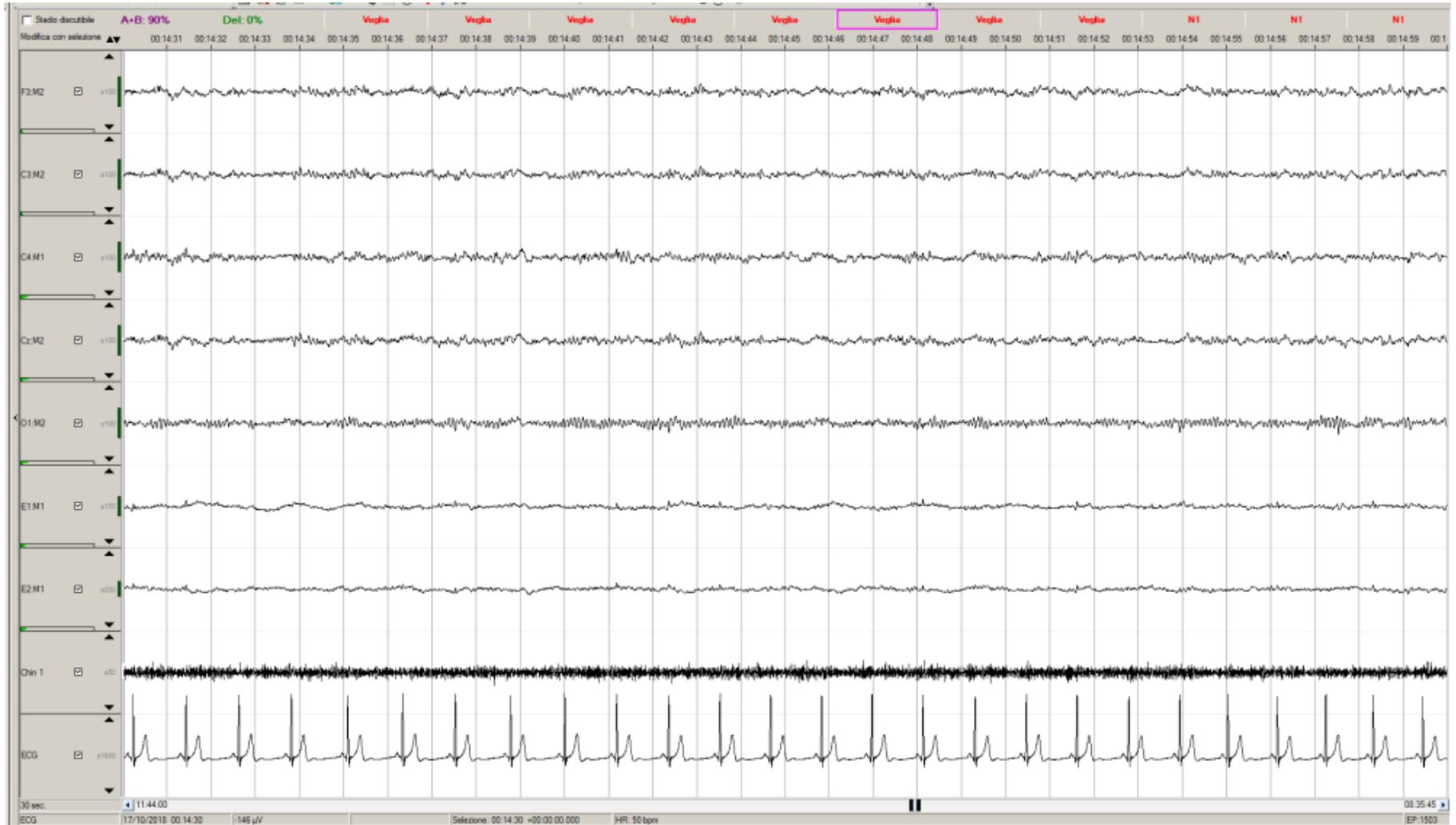
[ALTERNATIVE]

Backup electrodes should be placed at F₇, C₃, O₁, and M₁ to allow substitution of F₇ for F₃, C₃ for C₄, O₁ for O₂, and M₁ for M₂ if electrodes malfunction during the study.

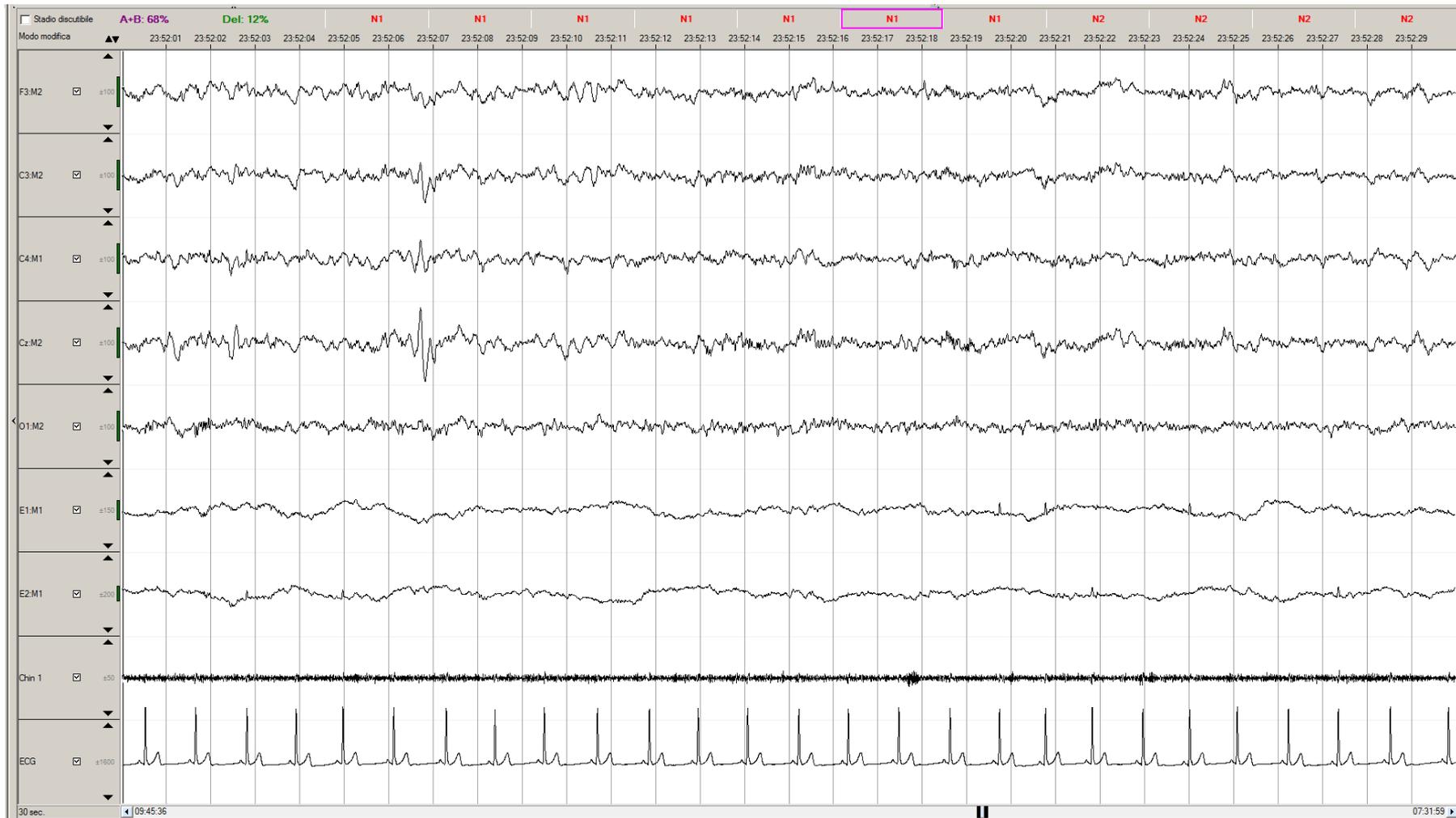


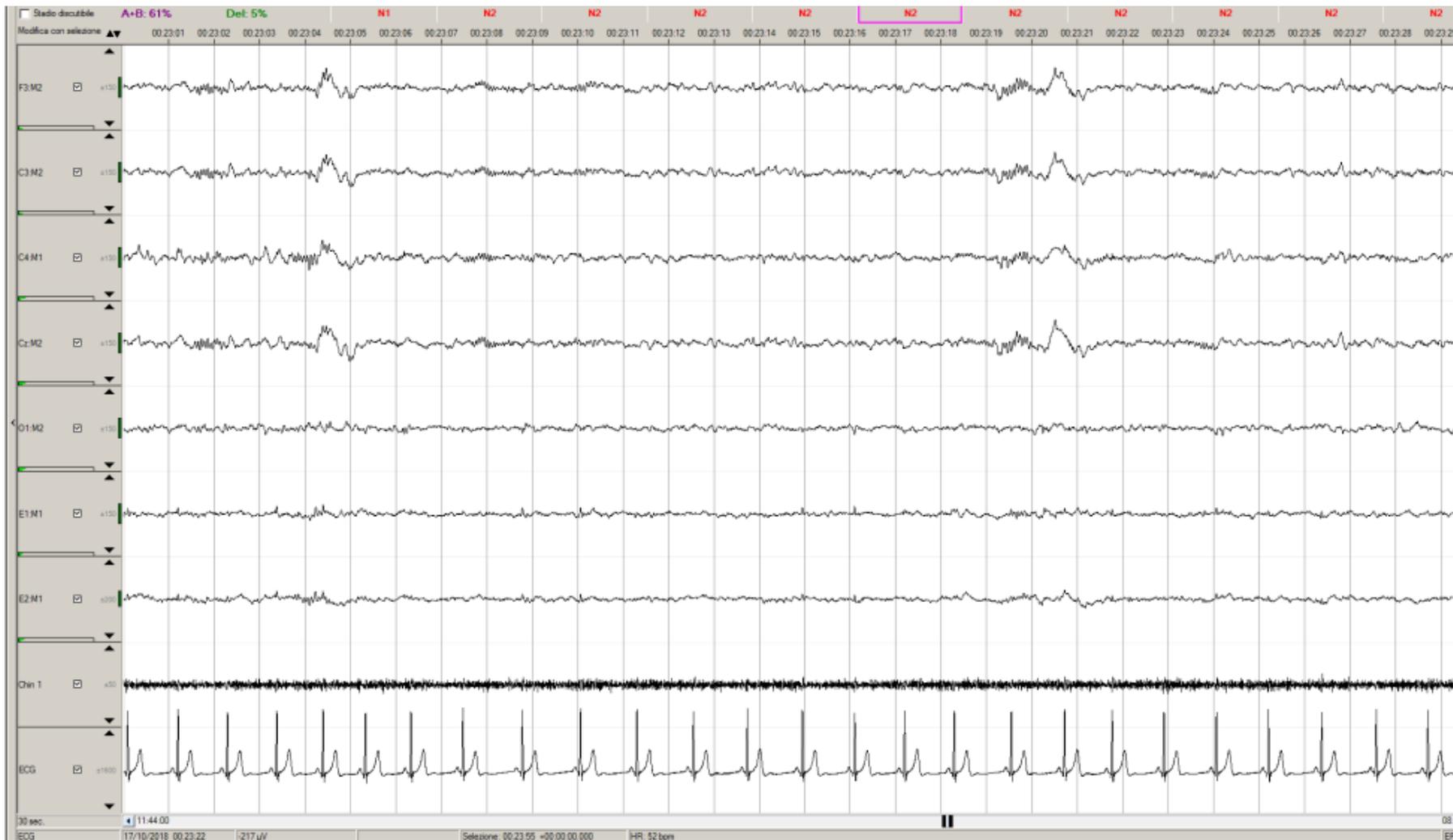
AASM Manual for Scoring Sleep, 2007 23

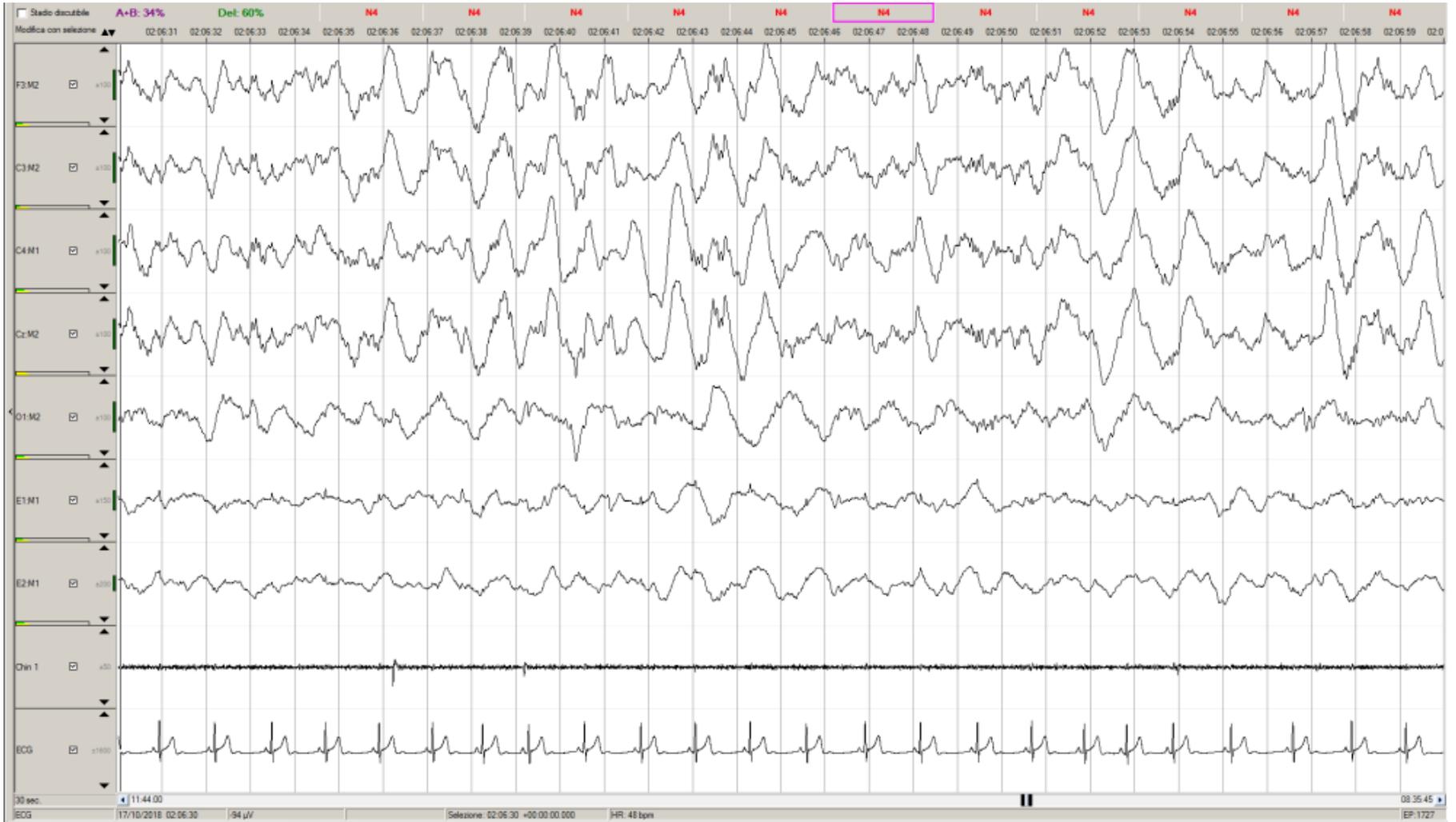
F3-M2
C3-M2
O1-M2
EOGr-M1
EOGI-M1
EMG sm
ECG

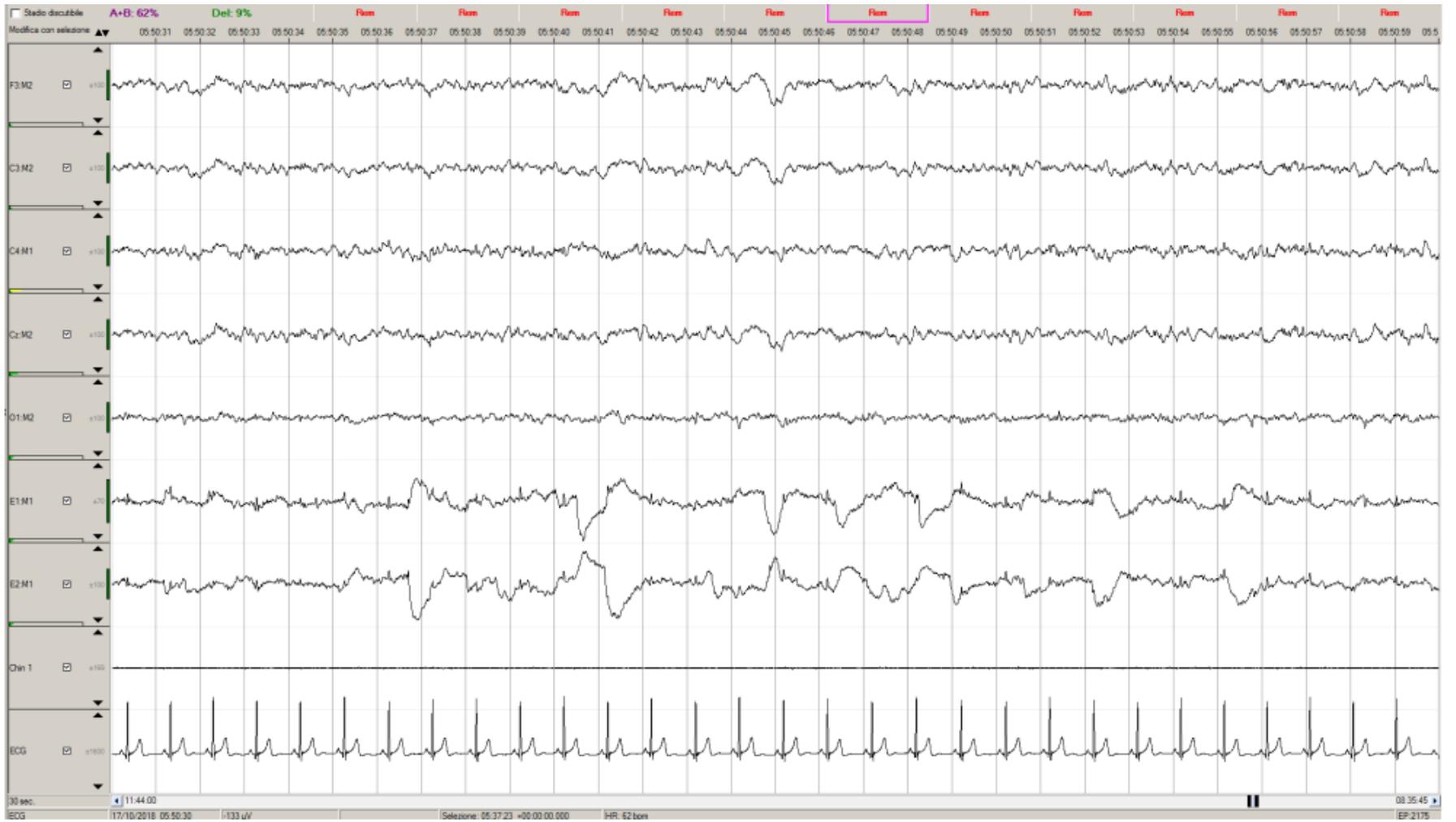


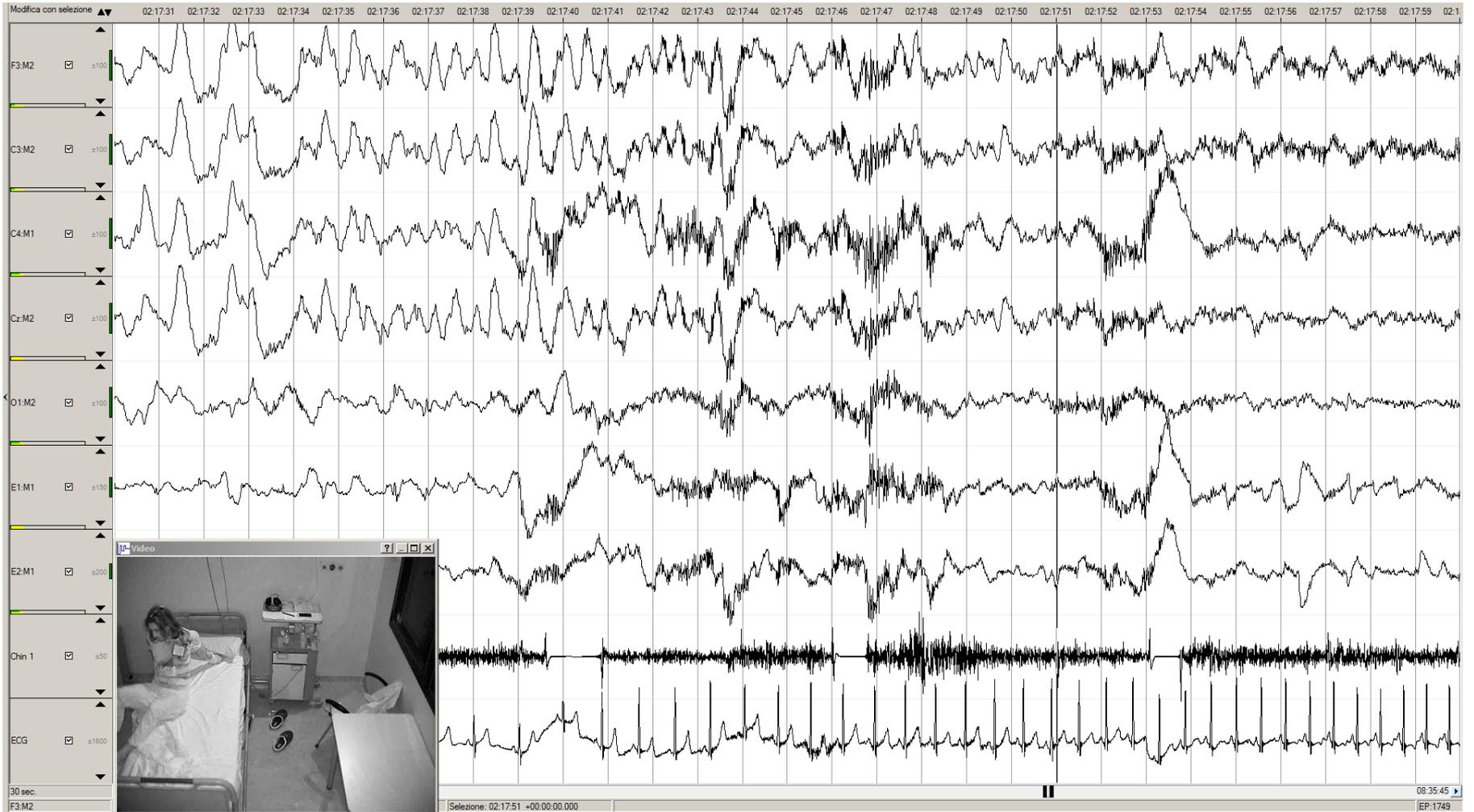
Stadiatione sonno ridotto numero EEG

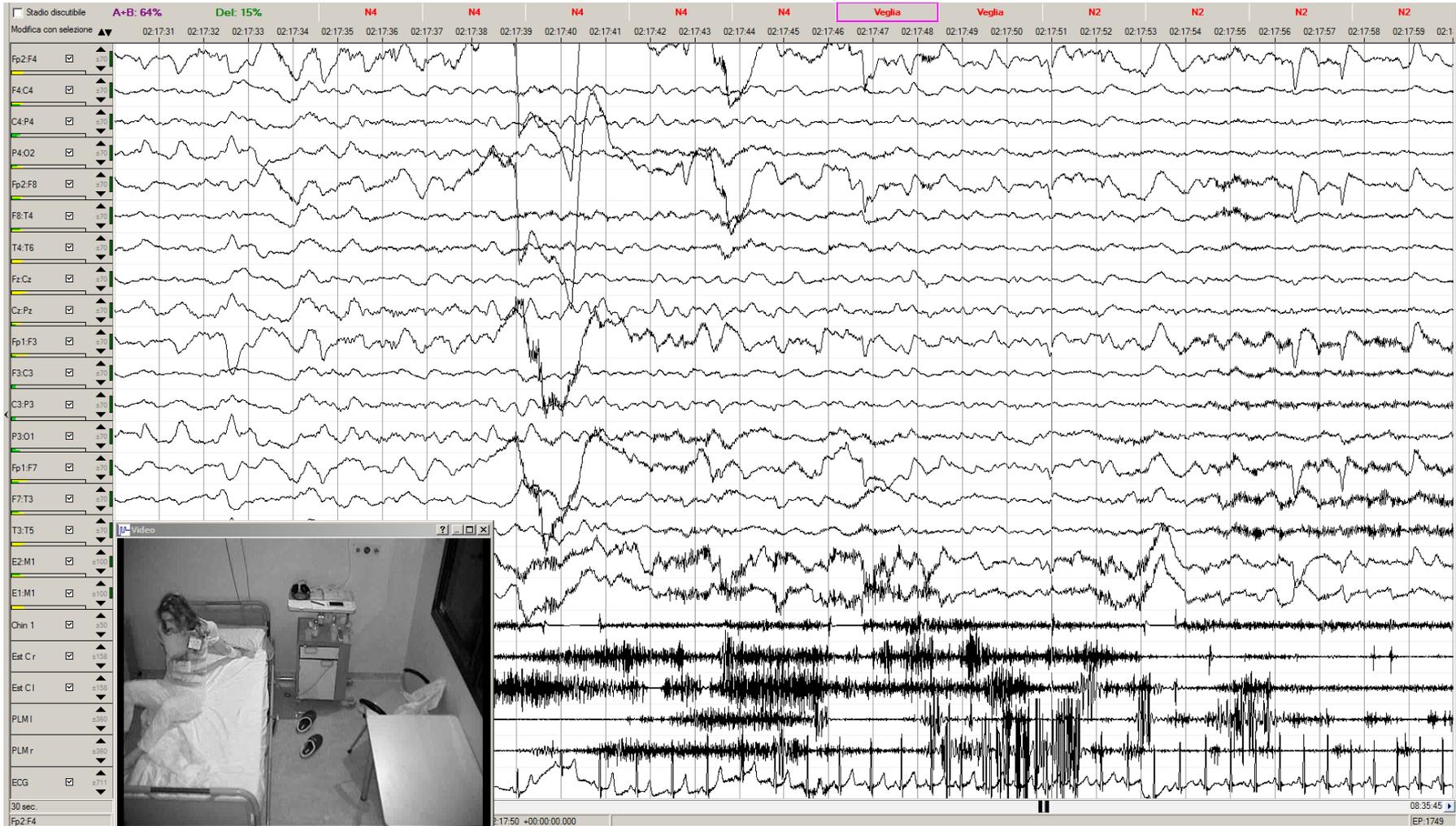






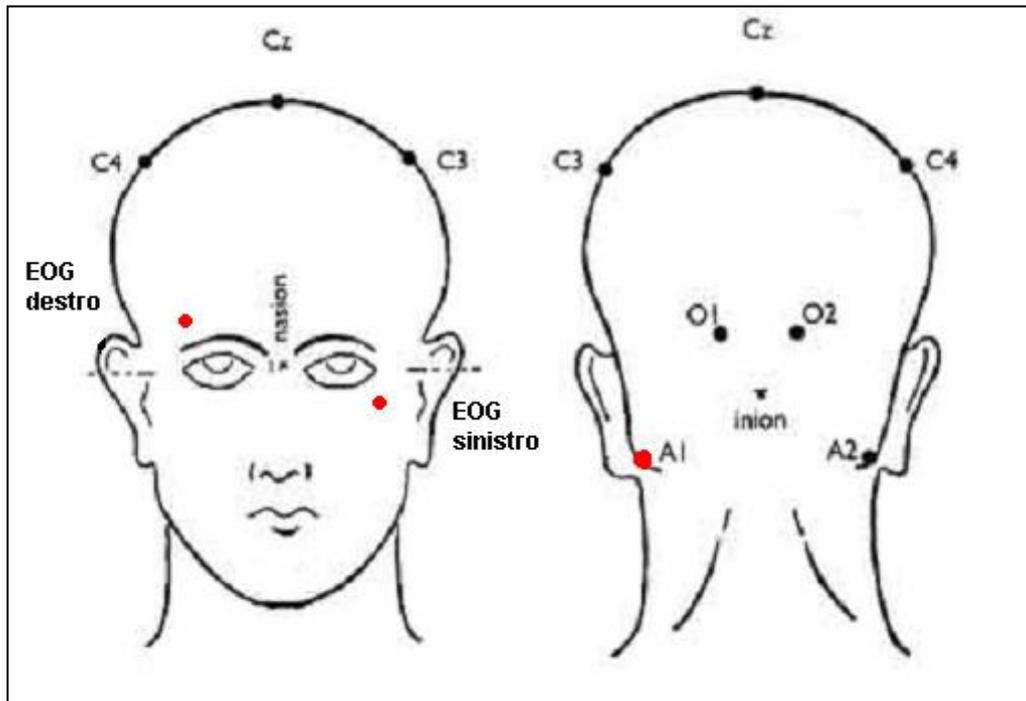
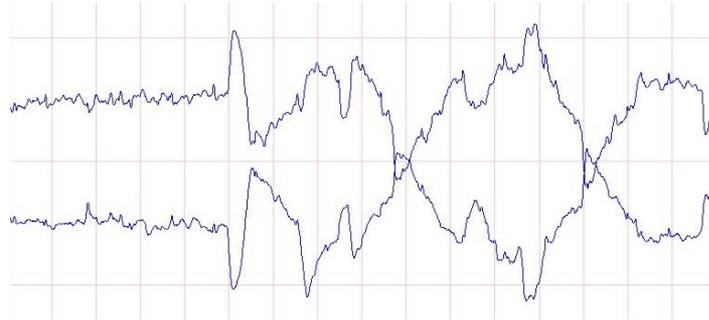




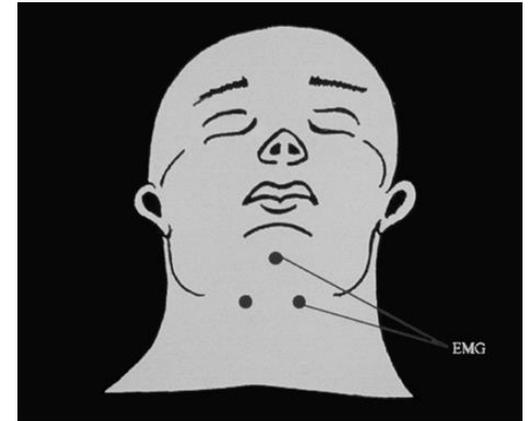
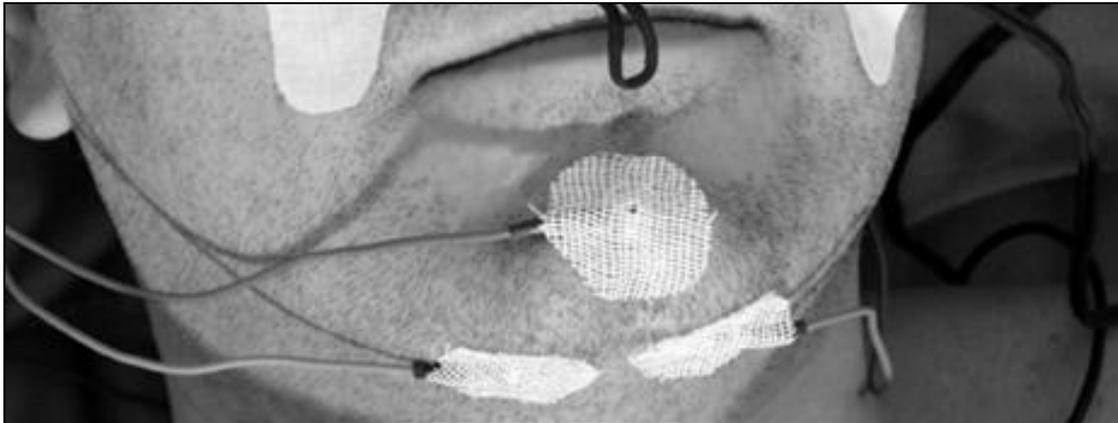
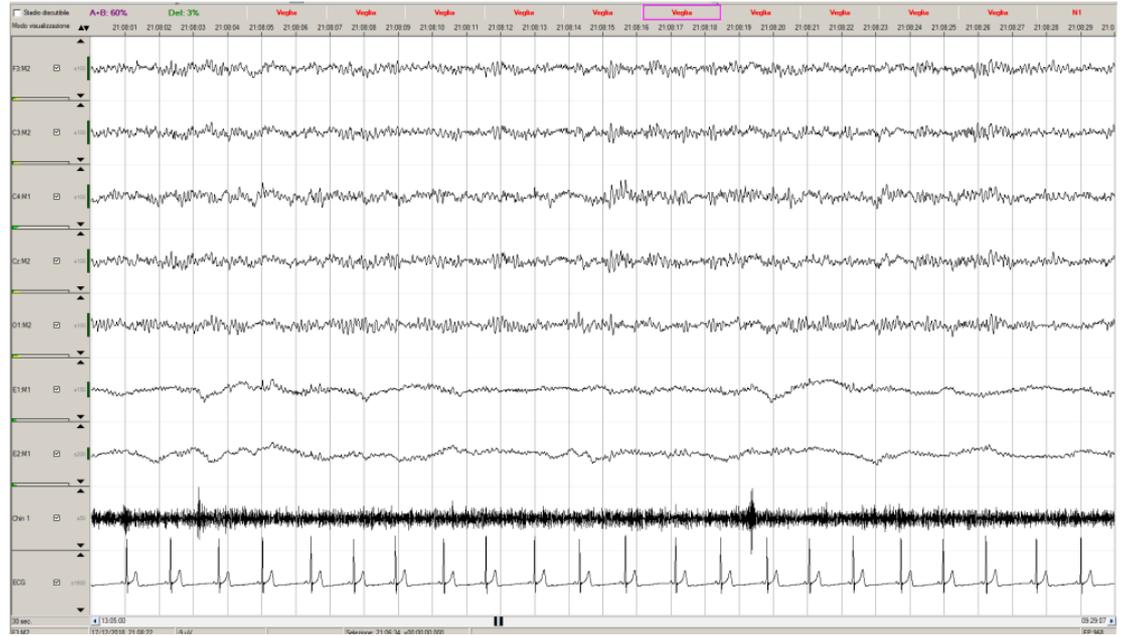


EOG Dx - M1

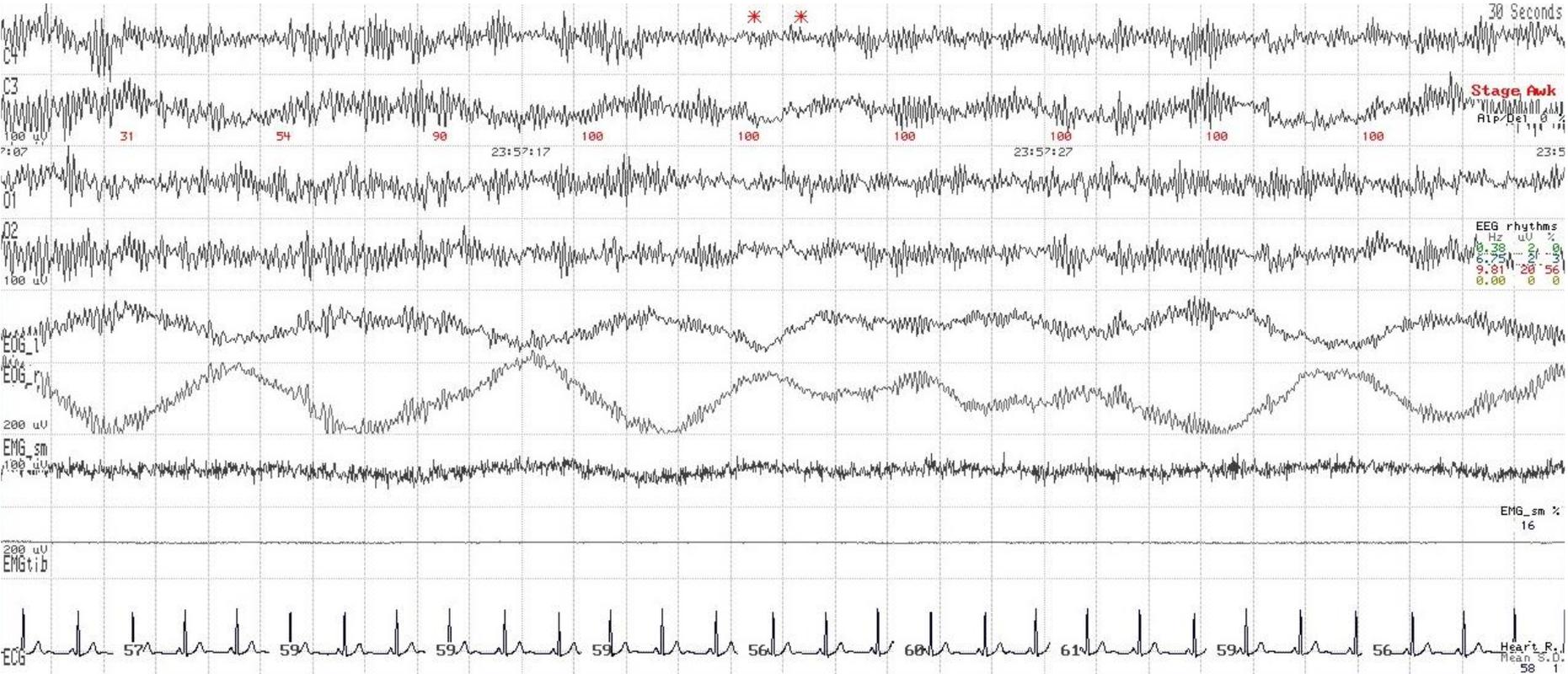
EOG Sn - M1



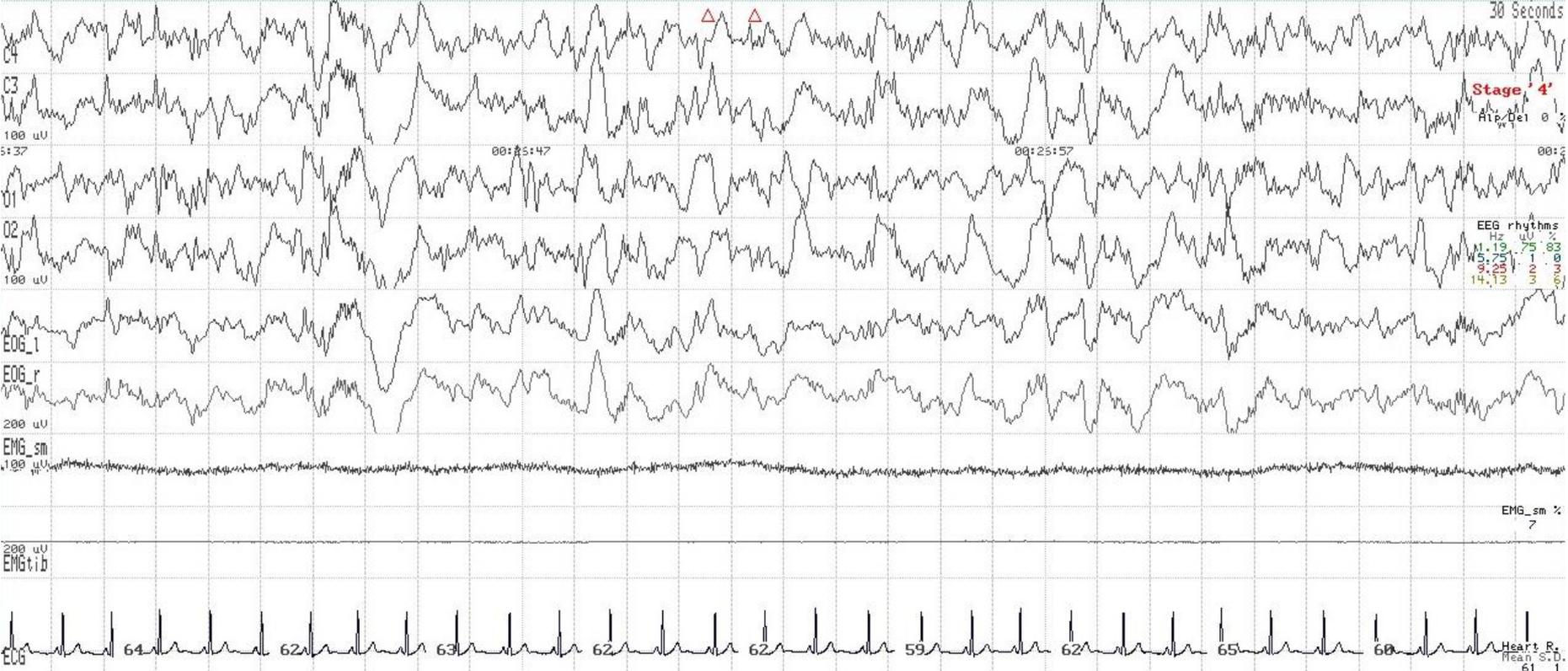
EMG



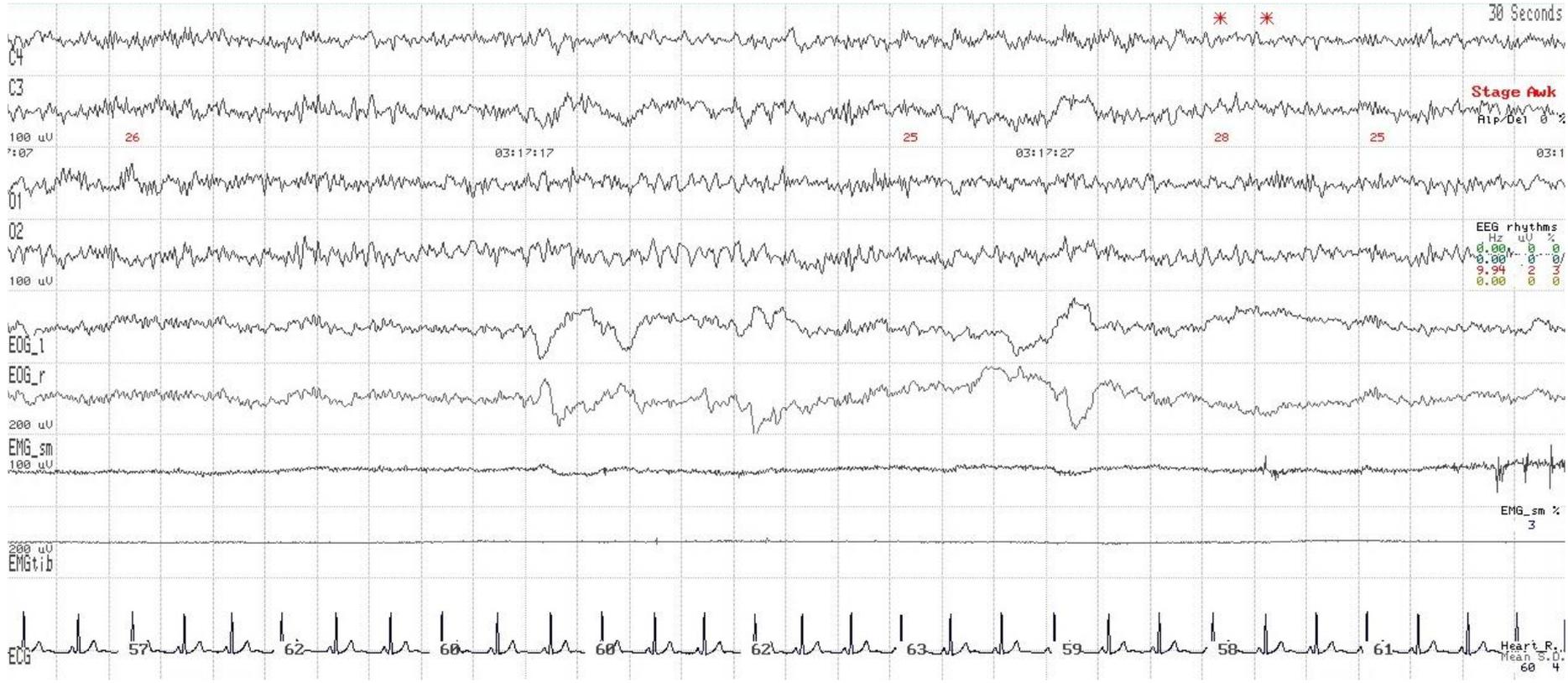
EMG Milioideo



EMG Milioideo

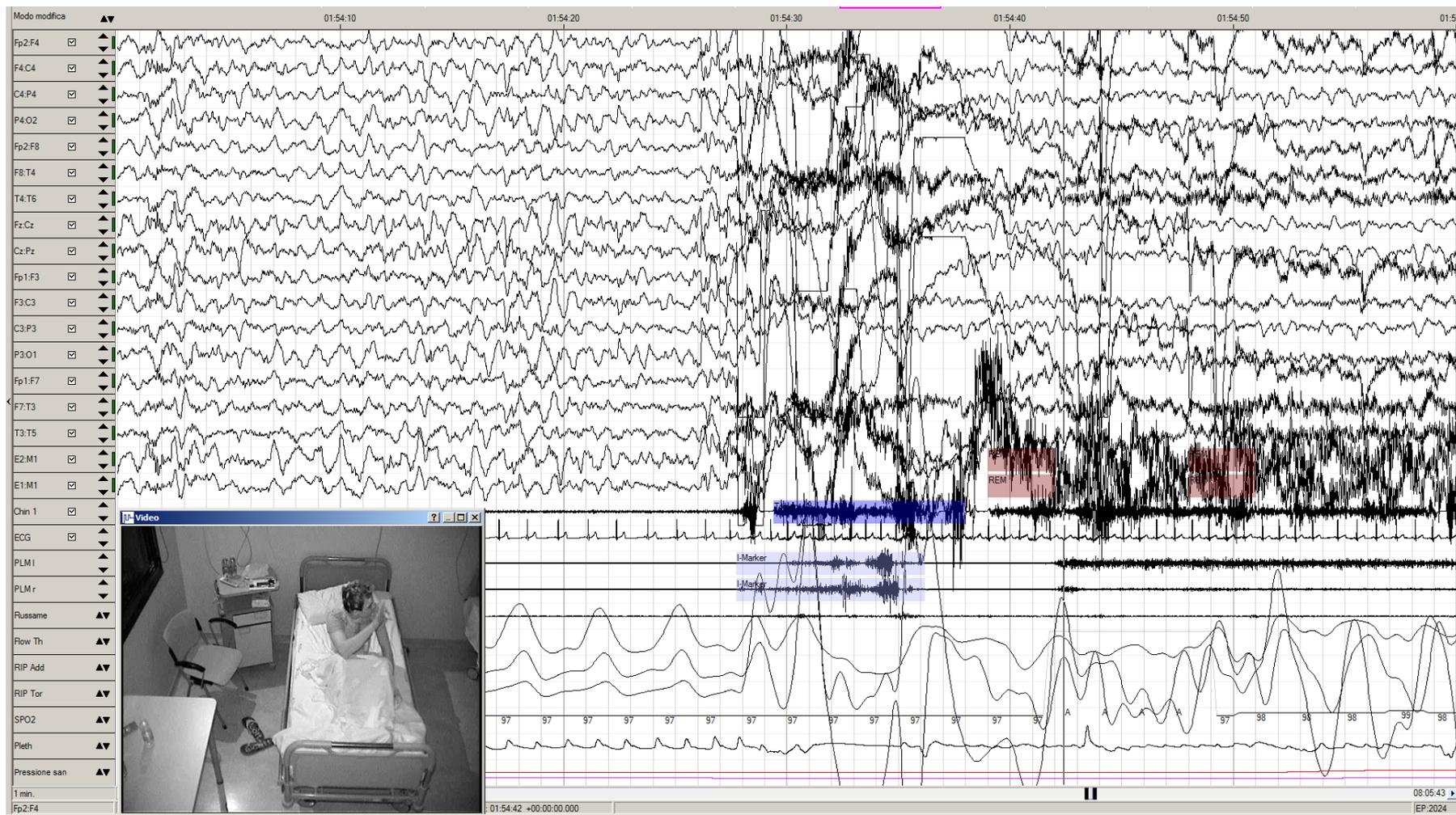


EMG Milioideo



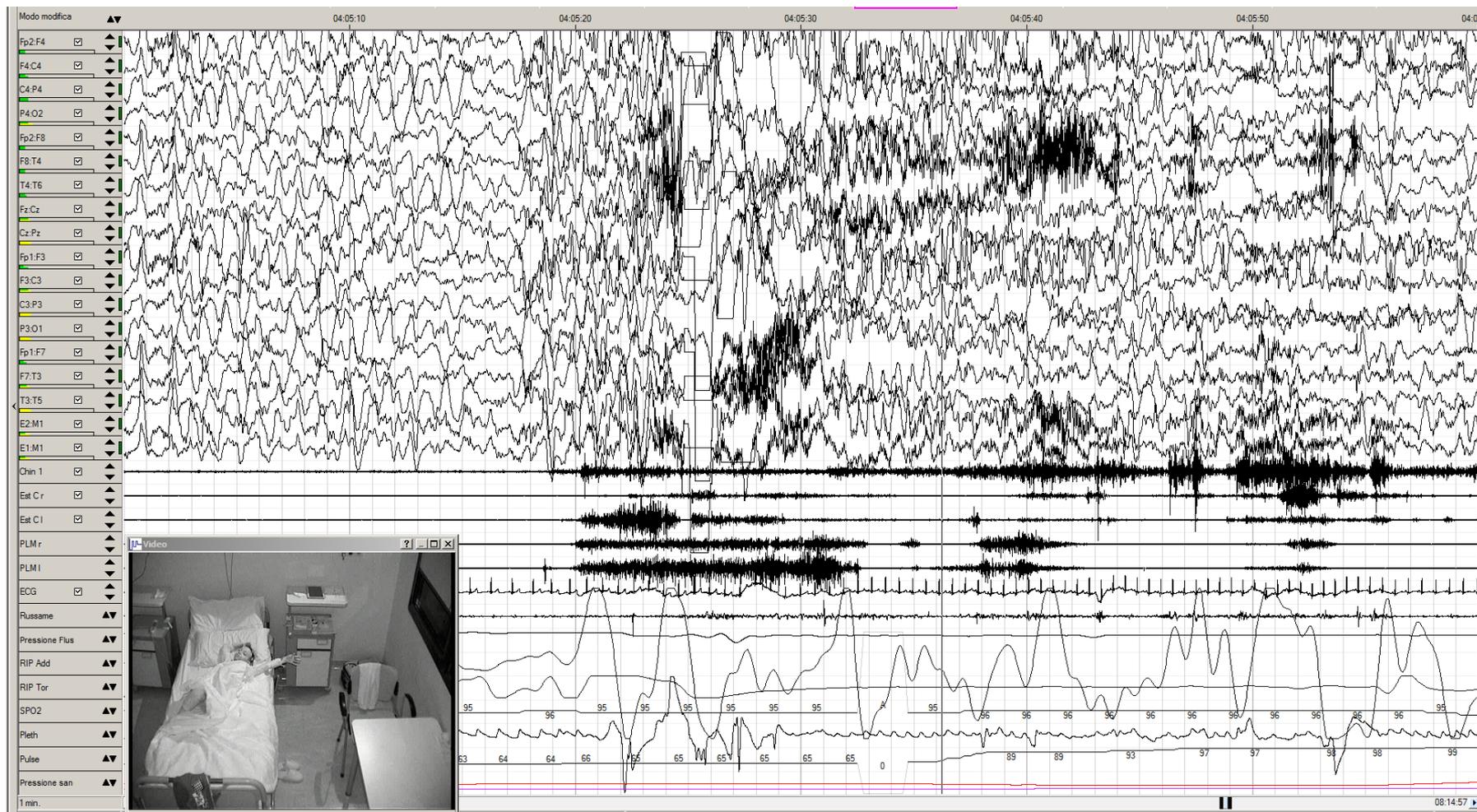


EMG Tibiali Anteriori



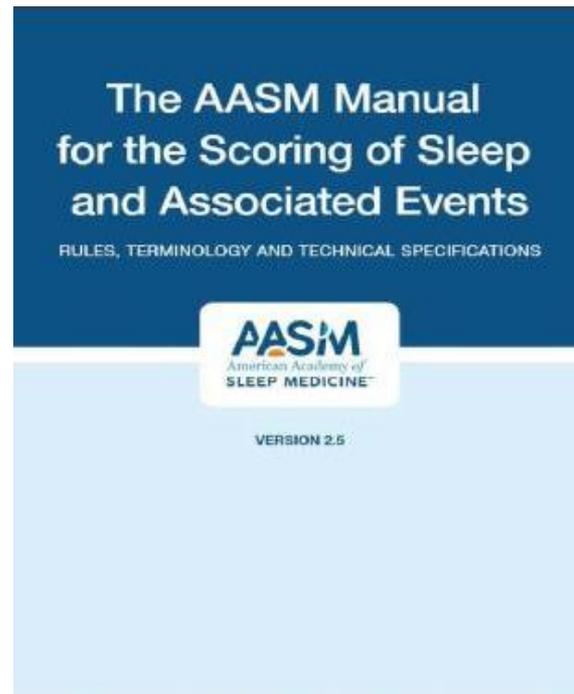
Attivazione

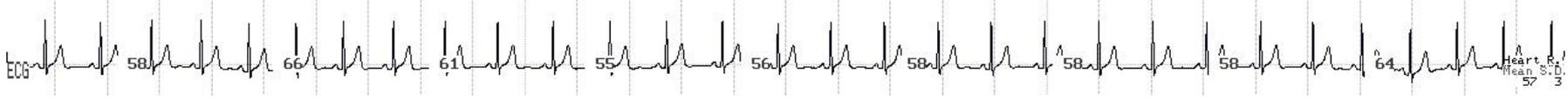
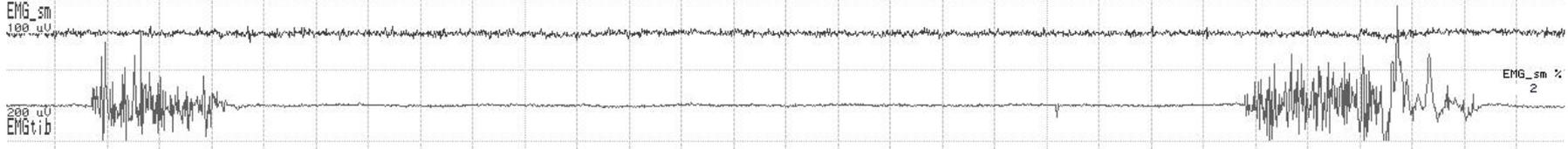
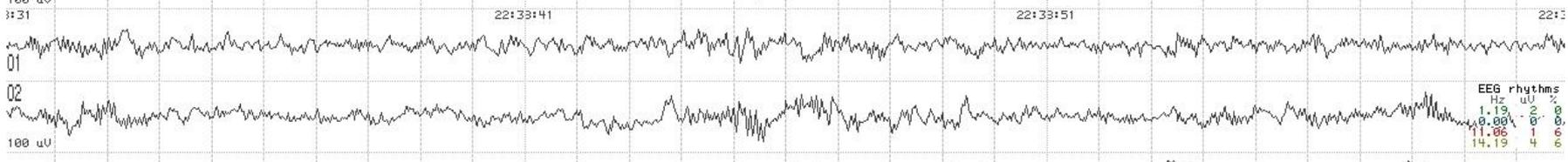
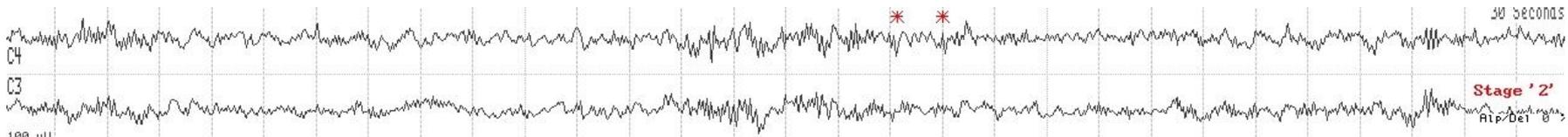
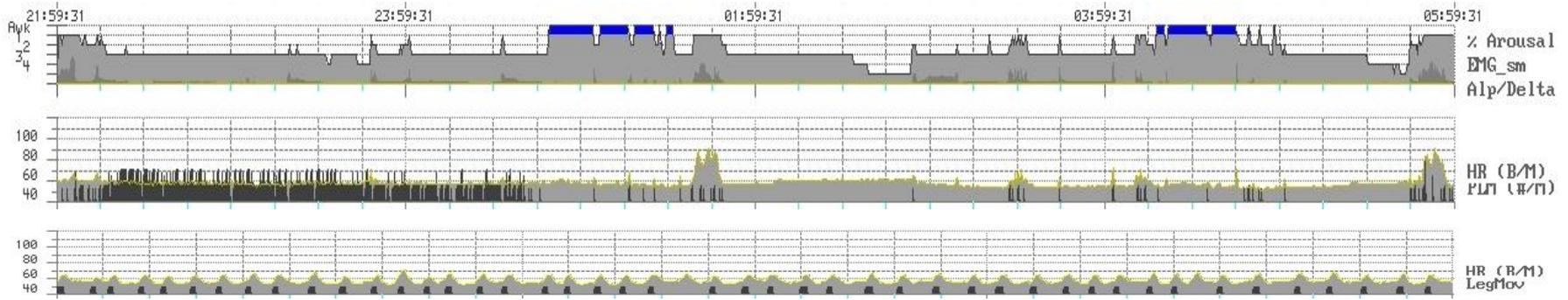
EMG Estensori Carpo Mano, Tibiali Anteriori



Attivazione

PLM





PLMS (Periodic Limb Movements in Sleep)

LM (Leg Movement) evento:

Durata minima 0.5 secondi

Durata massima 10 secondi

Ampiezza almeno 8 microV incremento

Inizio punto in cui si manifesta un incremento di 8 microV dall'attività di fondo

Fine punto in cui, negli 0.5 secondi finali, l'ampiezza rimane 2 microV sopra l'attività di fondo



PLMS (Periodic Limb Movements in Sleep)

LM (Leg Movement) evento:

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Fine punto in cui, negli 0.5 secondi finali, l'ampiezza rimane 2 microV sopra l'attività di fondo



PLMS (Periodic Limb Movements in Sleep)

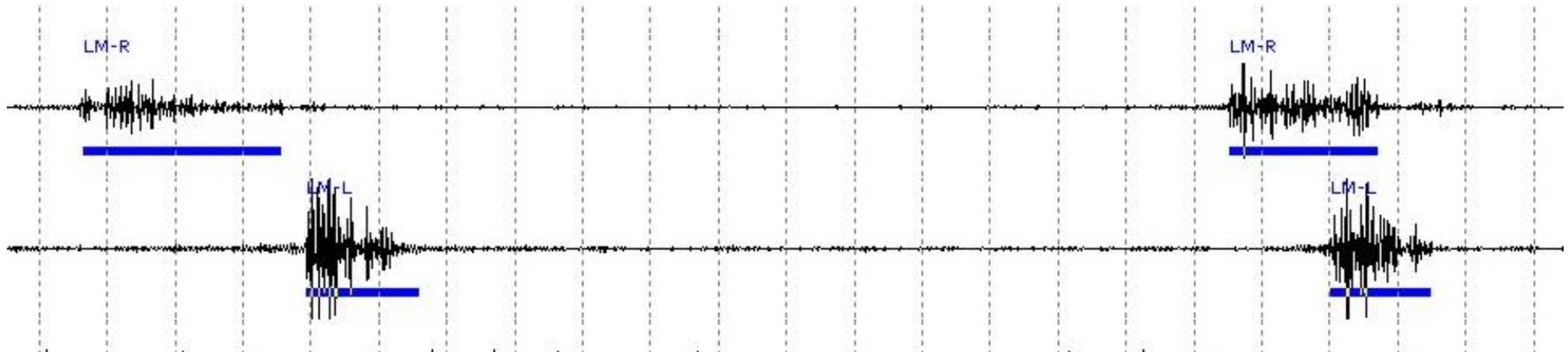
PLM sequenza:

Numero minimo 4 LM

Distanza minima tra 2 LM stesso arto 5 secondi

Distanza massima tra 2 LM 90 secondi

Distanza minima tra 2 LM di arti differenti 5 secondi



PLM Analysis [X]

Detection Parameters | **Advanced**

Select Left EMG: **EMGtil** | Select Right EMG: **EMGtib**

Start threshold μ V	Left: <input type="text" value="10"/>	Right: <input type="text" value="10"/>
Stop threshold μ V	Left: <input type="text" value="2"/>	Right: <input type="text" value="2"/>
Min LM duration (sec)	<input type="text" value="0.5"/>	
Max LM duration (sec)	<input type="text" value="10"/>	

PLM Sequence Scoring

Min PLM/sequence (no.)	<input type="text" value="4"/>	Score PLM during Wake	<input type="checkbox"/>
Min LM interval in seq. (s)	<input type="text" value="5"/>	Max R-L interval (s)	<input type="text" value="0.5"/>
Max LM interval in seq. (s)	<input type="text" value="90"/>		

0% 50% 100%

Detect

Cancel

PLM Analysis [X]

Detection Parameters | **Advanced**

<p>Left Filter (Hz)</p> <p>Low Cut: <input type="text" value="10"/> Hz</p> <p>High Cut: <input type="text" value="100"/> Hz</p>	<p>Right Filter (Hz)</p> <p>Low Cut: <input type="text" value="10"/> Hz</p> <p>High Cut: <input type="text" value="100"/> Hz</p>	<p>Detect LMs during:</p> <p><input type="checkbox"/> Wakefulness</p> <p><input type="checkbox"/> Movement Time</p> <p><input checked="" type="checkbox"/> Stage 1</p> <p><input checked="" type="checkbox"/> Stage 2</p> <p><input checked="" type="checkbox"/> Stage 3</p> <p><input checked="" type="checkbox"/> Stage 4</p> <p><input checked="" type="checkbox"/> REM</p> <p><input type="checkbox"/> Undefined</p>
<p>Left Notch</p> <p><input checked="" type="radio"/> Off</p> <p><input type="radio"/> 50 Hz</p> <p><input type="radio"/> 60 Hz</p>	<p>Right Notch</p> <p><input checked="" type="radio"/> Off</p> <p><input type="radio"/> 50 Hz</p> <p><input type="radio"/> 60 Hz</p>	

0% 50% 100%

Detect

Cancel

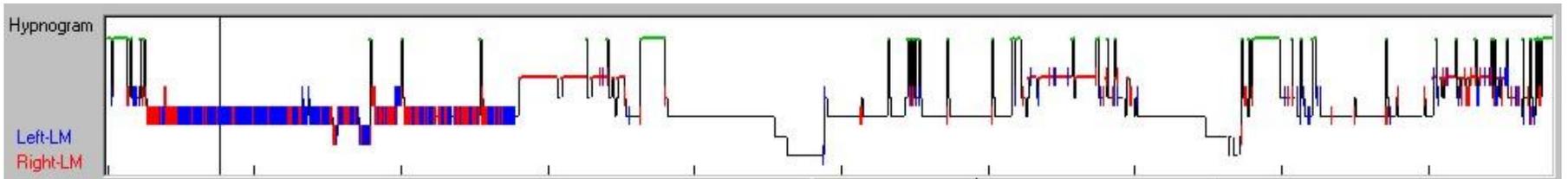
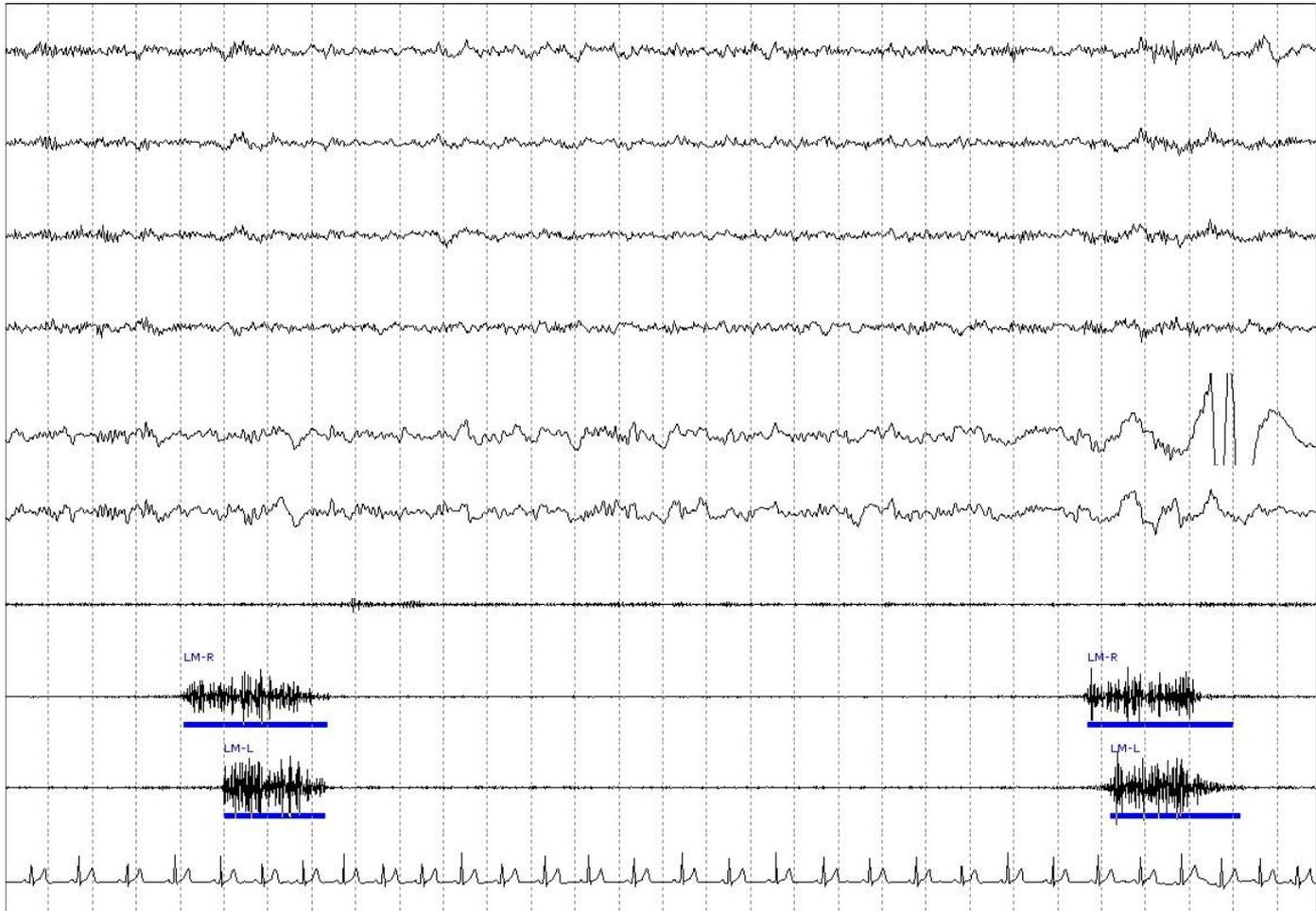


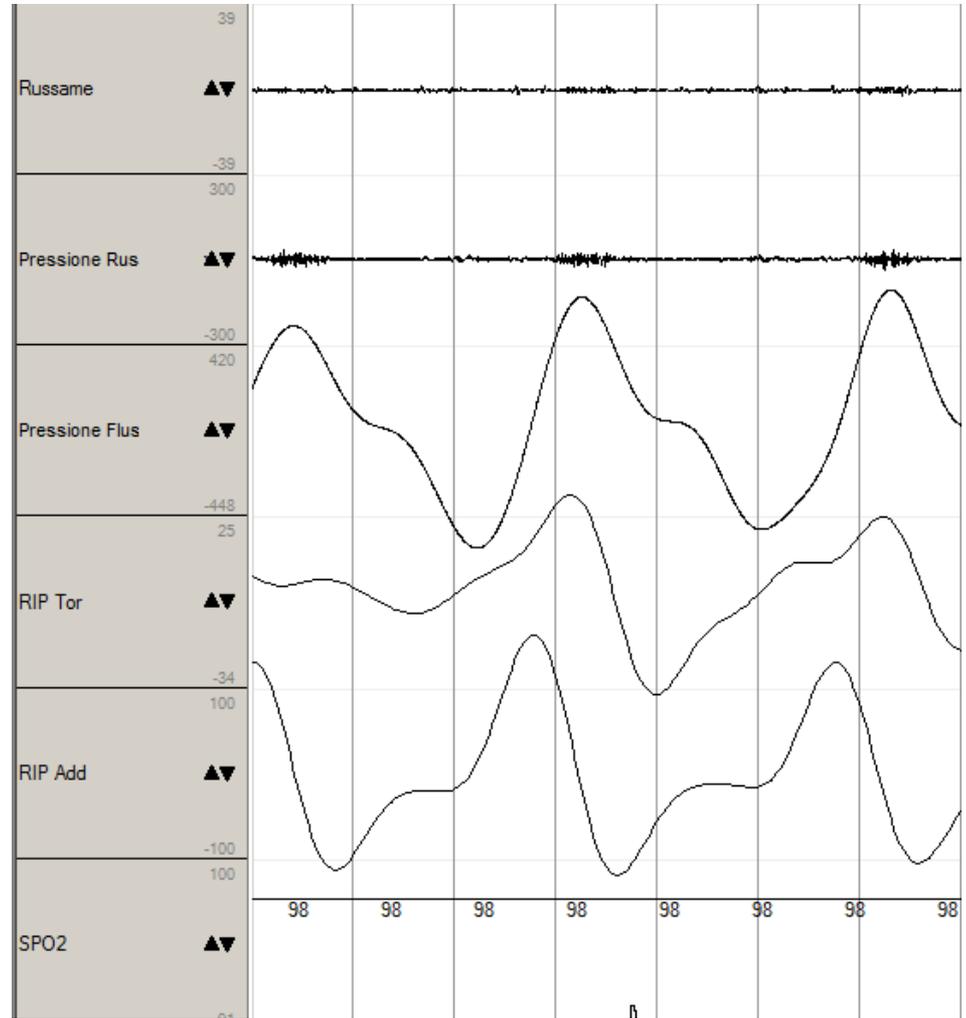
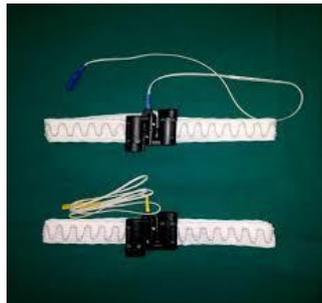
Table 1. Limb movement analysis

Stage	Total number (index)	In sequence (index)	Isolated (index)
<i>WASO</i>	0 (.00)	0 (.00)	0 (.00)
<i>S1</i>	88 (69.02)	52 (40.78)	36 (28.24)
<i>S2</i>	385 (68.65)	371 (66.15)	14 (2.50)
<i>SWS</i>	20 (29.63)	18 (26.67)	2 (2.96)
<i>NREM</i>	493 (65.23)	441 (58.35)	52 (6.88)
<i>REM</i>	26 (19.38)	10 (7.45)	16 (11.93)
<i>Total</i>	519 (58.26)	451 (50.63)	68 (7.63)

Table 2. Limb movement side analysis

Stage	Left	Right	Bilateral
<i>WASO</i>	0	0	0
<i>S1</i>	19	20	50
<i>S2</i>	44	69	274
<i>SWS</i>	3	2	15
<i>NREM</i>	66	91	339
<i>REM</i>	10	3	14
<i>Total</i>	76	94	353

Attività Respiratoria



1. SPECIFICATIONS

A. Digital Specifications for Routine PSG Recordings (Notes)

[RECOMMENDED]

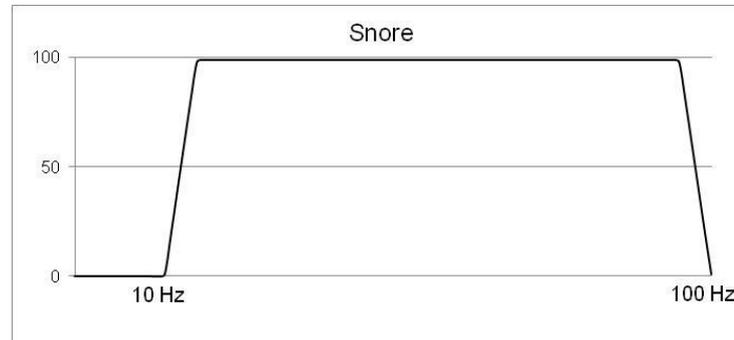
Maximum Electrode Impedances

5 K Ω ¹

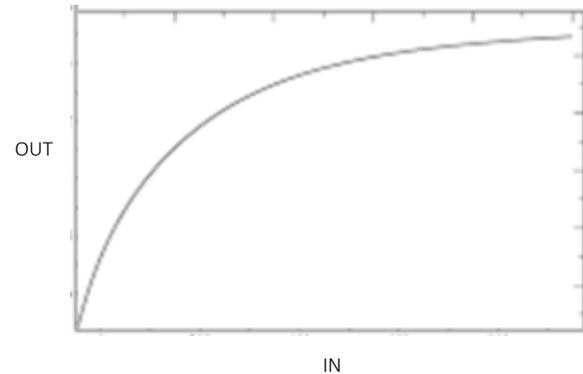
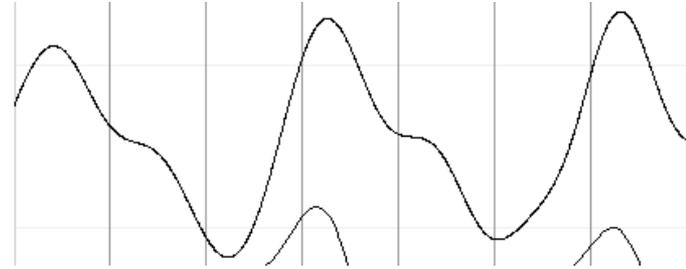
Minimum Digital Resolution

12 bits per sample

Sampling Rates	Desirable	Minimal
EEG	500 Hz ²	200 Hz ³
EOG	500 Hz ⁴	200 Hz
EMG	500 Hz ⁵	200 Hz
ECG	500 Hz ⁶	200 Hz
Airflow	100 Hz	25 Hz
Oximetry	25 Hz ⁷	10 Hz
Nasal Pressure	100 Hz ⁸	25 Hz
Esophageal Pressure	100 Hz	25 Hz
Body Position	1 Hz	1 Hz
Snoring Sounds	500 Hz ⁹	200 Hz
Rib Cage and Abdominal Movements	100 Hz ¹⁰	25 Hz
Routinely Recorded Filter Settings	Low Frequency Filter	High Frequency Filter¹¹
EEG	0.3 Hz	35 Hz ³
EOG	0.3 Hz	35 Hz
EMG	10 Hz ⁵	100 Hz ⁵
ECG	0.3 Hz ¹²	70 Hz
Respiration	0.1 Hz	15 Hz
Snoring	10 Hz	100 Hz



Flusso Oro-Nasale

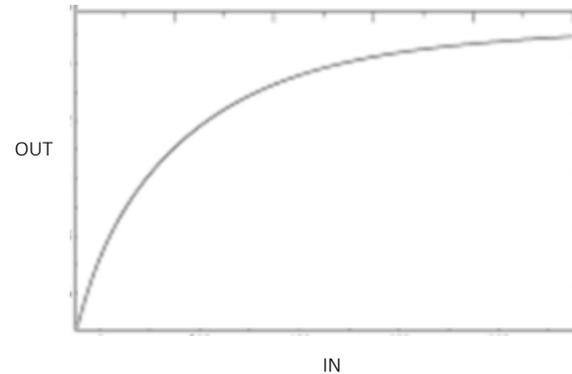
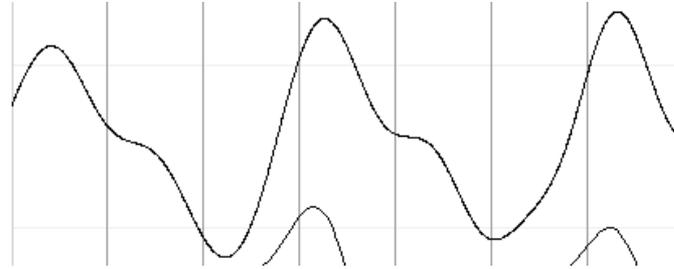


Termistore

- Resistenza sensibile alle variazioni di temperatura
- Trasforma le variazioni di temperatura in variazioni di segnale elettrico
- Necessita di alimentazione
- Viene fissato con un cerotto sagomato
- I sensori devono essere posizionati davanti alle narici ed alla bocca
- I sensori non devono toccare la pelle

- Il segnale in uscita non garantisce linearità di ampiezza

Flusso Oro-Nasale

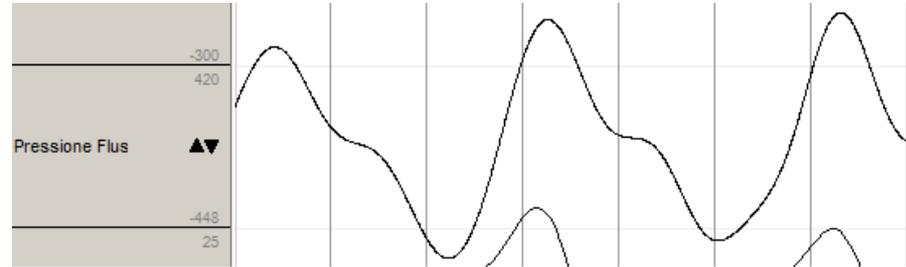


Termocoppia (più utilizzato)

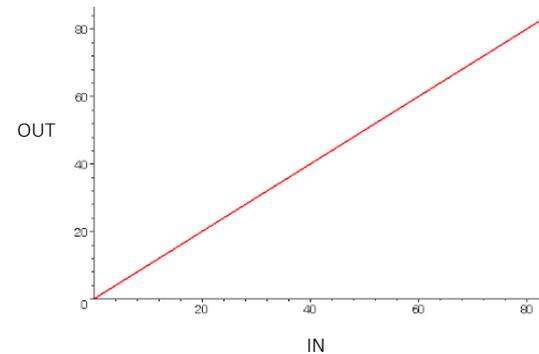
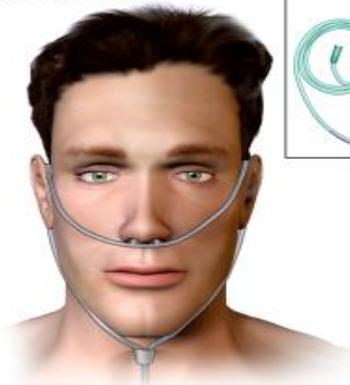
- Accoppiamento di metalli sensibile alle variazioni di temperatura
- Trasforma le variazioni di temperatura in variazioni di segnale elettrico
- Non necessita di alimentazione
- Viene fissato con un cerotto sagomato
- I sensori devono essere posizionati davanti alle narici ed alla bocca
- I sensori non devono toccare la pelle

- Il segnale in uscita non garantisce linearità di ampiezza

Flusso Oro-Nasale



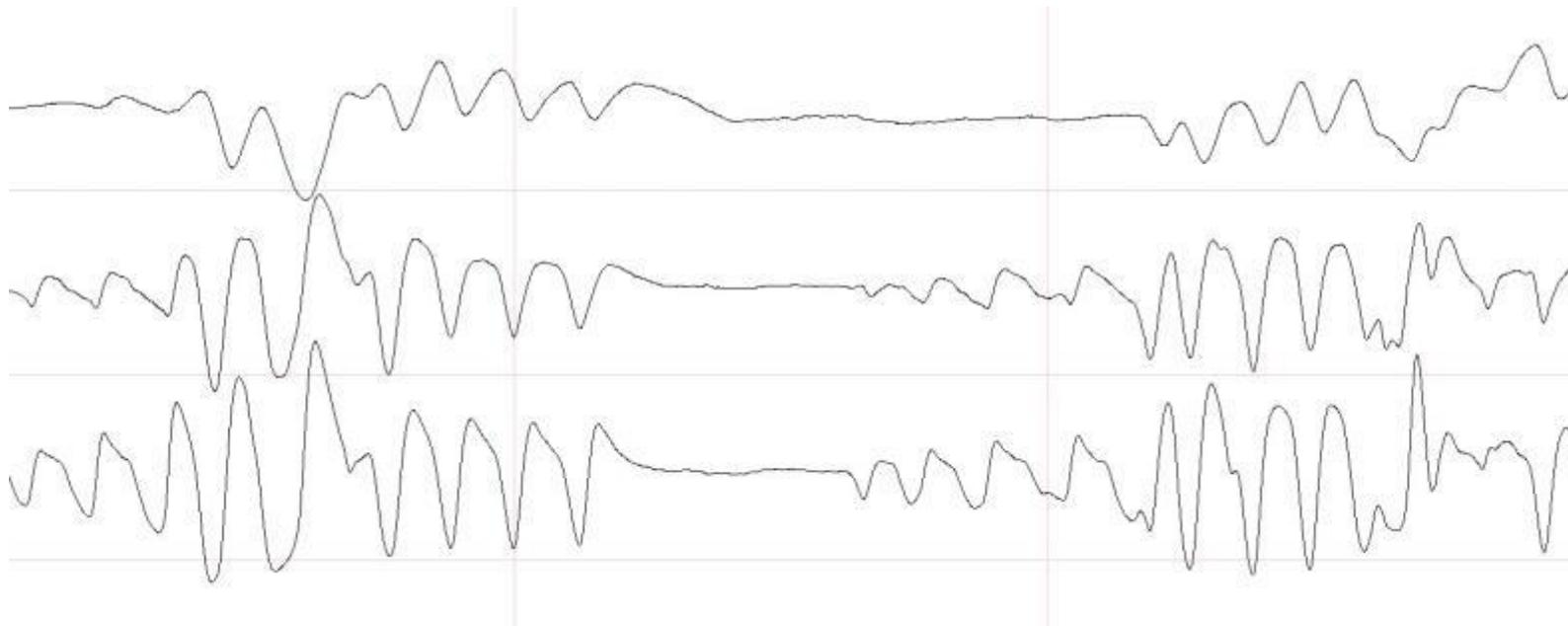
Nasal Cannula



Nasocanula

- Tramite una nasocanula si preleva il flusso respiratorio dalle narici.
 - Un trasduttore (integrato o esterno) di pressione trasforma la pressione in segnale elettrico.
 - I sensori devono essere posizionati dentro alle narici.
 - E' bene fissare la nasocanula con un cerotto sagomato.
-
- Il segnale in uscita garantisce linearità di ampiezza.

Attività toracica ed addominale



1. SPECIFICATIONS

A. Digital Specifications for Routine PSG Recordings (Notes)

[RECOMMENDED]

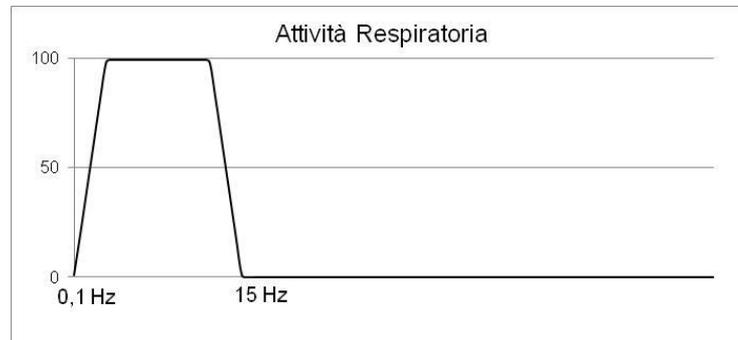
Maximum Electrode Impedances

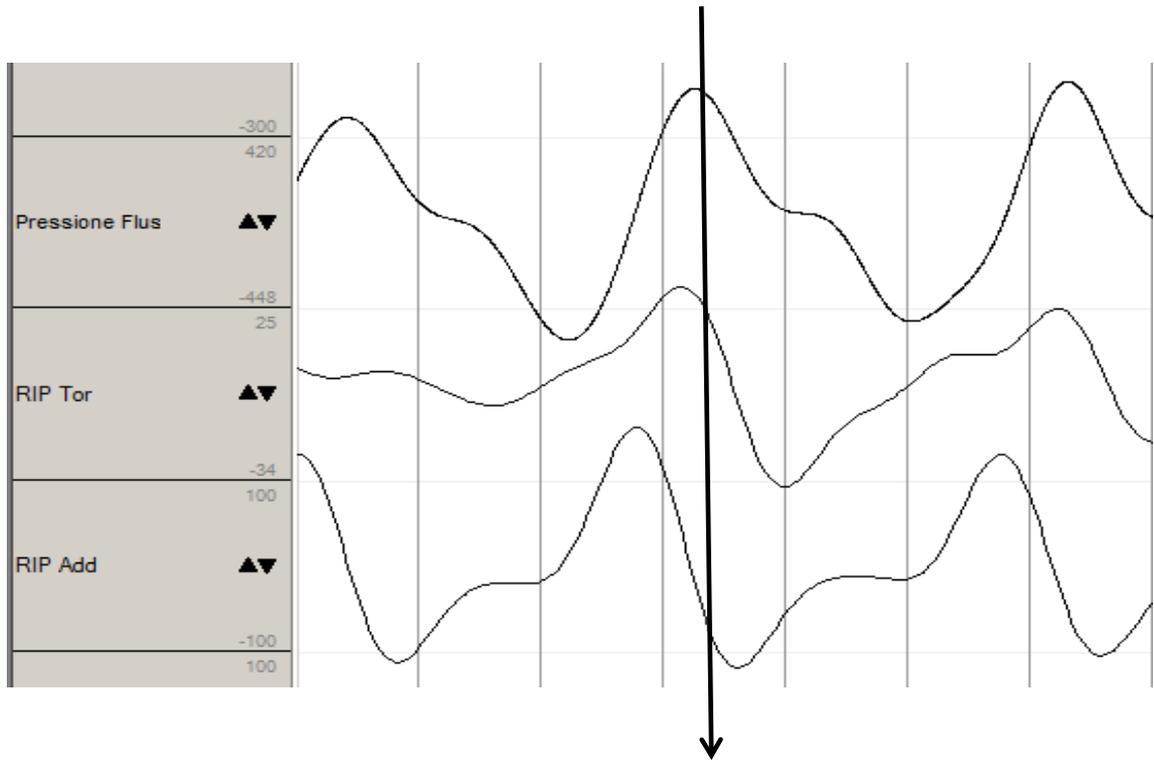
5 K Ω ¹

Minimum Digital Resolution

12 bits per sample

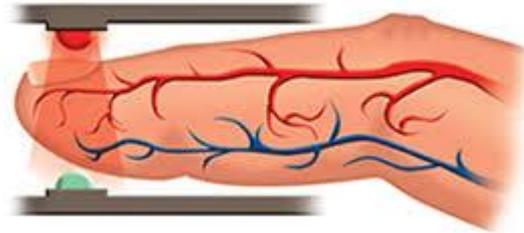
Sampling Rates	Desirable	Minimal
EEG	500 Hz ²	200 Hz ³
EOG	500 Hz ⁴	200 Hz
EMG	500 Hz ⁵	200 Hz
ECG	500 Hz ⁶	200 Hz
Airflow	100 Hz	25 Hz
Oximetry	25 Hz ⁷	10 Hz
Nasal Pressure	100 Hz ⁸	25 Hz
Esophageal Pressure	100 Hz	25 Hz
Body Position	1 Hz	1 Hz
Snoring Sounds	500 Hz ⁹	200 Hz
Rib Cage and Abdominal Movements	100 Hz ¹⁰	25 Hz
Routinely Recorded Filter Settings	Low Frequency Filter	High Frequency Filter¹¹
EEG	0.3 Hz	35 Hz ³
EOG	0.3 Hz	35 Hz
EMG	10 Hz ⁵	100 Hz ⁵
ECG	0.3 Hz ¹²	70 Hz
Respiration	0.1 Hz	15 Hz
Snoring	10 Hz	100 Hz





Biocalibrazione verifica polarità

Saturimetria



- % di emoglobina impiegata nel trasporto di ossigeno
- Emettitore di luce a diverse lunghezze d'onda
- Ricevitore
- Unità di calcolo differenza luce emessa luce ricevuta
- Range di valori 0-100%
- Ogni strumento ha una soglia di attendibilità del segnale (< 50%)

Posizione Corporea



In base alla posizione il sensore fornisce in uscita un valore di tensione diverso



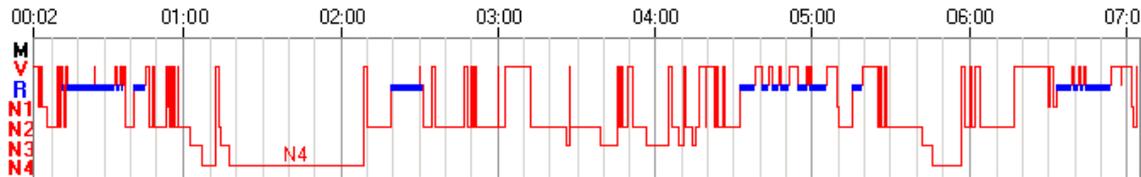
Cablaggio elettrodi e trasduttori

Posizione	Supino	non supino	Sinistra	Destra	Prono	Alzato
Frazione tempo di sonno [%]	31.0	69.0	24.0	45.0	-	-
RDI	74 (36.9)	63 (14.8)	42 (31.0)	21 (7.2)	-	-
Apnee ostruttive (Indice)	28 (14.0)	14 (3.3)	11 (8.1)	3 (1.0)	-	-
Apnee centrali (Indice)	-	-	-	-	-	-
Apnee miste (Indice)	11 (5.5)	29 (6.8)	28 (20.7)	1 (0.3)	-	-
Ipopnee (Indice)	34 (17.0)	18 (4.2)	2 (1.5)	16 (5.5)	-	-
Limitazioni al flusso (Indice)	-	-	-	-	-	-
RERAs (Indice)	1 (0.5)	2 (0.5)	1 (0.7)	1 (0.3)	-	-
Numero di desaturazioni (Indice)	66 (33.0)	59 (13.2)	42 (27.1)	17 (5.8)	-	-

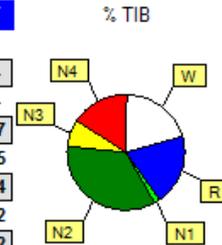
	Tutto	Prono	Supino	Sinistra	Destra	Alzato
Russamento (Indice)	1772 (274.4)	-	244 (121.8)	87 (56.2)	1441 (495.7)	-
Russamento assoluto [min]	33.9	-	3.9	1.8	28.2	-
Russamento epis. [min]	113.6	-	11.9	4.6	97.2	-
ø Ampl. (Max. Ampl) [dB]	39 (63)	-	35 (53)	31 (35)	40 (63)	-

DEFINIZIONI/CALCOLO PARAMETRI
SONNO

Stadi del sonno



Tempo Totale di sonno (TST)	05:36:30	Stadio sonno	Durata	(%) TIB	(%) TST	(%) SPT
Efficienza del sonno [%]	79.8	Artefatto	-	-	-	-
Eff. sonno sost. [%]	80.5	Movimento	-	-	-	-
Latenza del sonno [m]	3.5	Veglia	01:24:59	20.2	-	19.7
Latenza del sonno N1 [m]	2.0	REM	01:25:30	20.3	25.4	20.5
Latenza del sonno N2 [m]	5.5	N1	00:07:00	1.7	2.1	1.4
Latenza sonno profondo [m]	60.5	N2	02:27:00	34.9	43.7	35.2
Latenza REM [m]	7.0	N3	00:30:00	7.1	8.9	7.2
Periodo totale di sonno (SPT)	06:58:00	N4	01:07:00	15.9	19.9	16.0
Variaz. stadi del sonno (Indice)	136 (19.4)	Sonno Legg.	02:34:00	36.5	45.8	36.6
Numero veglie (Indice)	56 (10.0)	Sonno Prof.	01:37:00	23.0	28.8	23.2
Num. Veglie >3 min (Indice)	7 (1.2)					
# Veglia resp. (Indice)	0 (0.0)					
Durata veglia SPT	01:22:30					
Densità REM [%]	2					
WASO	01:22:30					



Index

Index = numero di eventi / TST espresso in ore

Il tempo in cui vengono registrati gli eventi è un elemento determinante.

Per rendere confrontabile il numero di eventi identificati in un periodo di sonno con:

- un altro periodo di sonno dello stesso Paziente in condizioni diverse,
- registrazioni di altri Pazienti,
- tabelle di riferimento diagnostiche,

è necessario normalizzare gli eventi rispetto al TST, il Tempo Totale di sonno (N1+N2+N3+REM), riconducendo il numero di eventi di tutta la registrazione ad un'ora di sonno rappresentativa.

Es. 30 desaturazioni registrate in 90 minuti di sonno ODI: $30/1.5 = 20$

30 desaturazioni registrate in 7 ore di sonno ODI: $30/7 = 4.29$

L'index riferito a periodi di sonno inferiori ad un'ora rappresenta una proiezione da valutare con estrema attenzione.

Es. 30 desaturazioni registrate in 30 minuti di sonno ODI: $30/0.5 = 60$

Sleep
9(4):519–524, Raven Press, New York
© 1986, Association of Professional Sleep Societies

**Guidelines for the Multiple Sleep Latency Test (MSLT):
A Standard Measure of Sleepiness***

Chairman:
Mary A. Carskadon

*Report From the
American Sleep Disorders Association*

The Clinical Use of the Multiple Sleep Latency Test

Sleep 1992

REVIEW PAPER

The Clinical Use of the MSLT and MWT

Donna Arand, Ph.D¹, Michael Bonnet, Ph.D², Thomas Hurwitz, M.D³, Merrill Mitler, Ph.D⁴, Roger Rosa, Ph.D⁵ and R. Bart Sangal, M.D⁶

¹ Kettering Medical Center, Dayton, OH, ²Dayton Veteran's Affairs Medical Center and Wright State University, Dayton, OH, ³Minneapolis Veteran's Affairs Medical Center and University of Minnesota, Minneapolis, MN, ⁴National Institute of Neurological Disorders & Stroke Neuroscience Center, Bethesda, MD, ⁵National Institute for Occupational Safety and Health, Washington, DC, ⁶Sleep Disorders Institute, Troy, MI

Citation: Review by the MSLT and MWT Task Force of the Standards of Practice Committee of the American Academy of Sleep Medicine. *SLEEP* 2005;28(1):123-144.

PRACTICE PARAMETER

Practice Parameters for Clinical Use of the Multiple Sleep Latency Test and the Maintenance of Wakefulness Test

An American Academy of Sleep Medicine Report

Standards of Practice Committee of the American Academy of Sleep Medicine

Michael R. Littner MD¹; Clete Kushida MD, PhD²; Merrill Wise MD³; David G. Davila, MD⁴; Timothy Morgenthaler MD⁵; Teofilo Lee-Chiong MD⁶; Max Hirshkowitz PhD⁷; Daniel L. Loube MD⁸; Dennis Bailey DDS⁹; Richard B. Berry MD¹⁰; Sheldon Kapen MD¹¹; Milton Kramer MD¹²

SLEEP, Vol 28, No. 1, 2005

Box 1

Recommendations for the MSLT Protocol

(Adapted from Carskadon and colleagues, Guidelines for the multiple sleep latency test (MSLT): a standard measure of sleepiness⁹.

Modified by collective expert opinion using Rand/UCLA Appropriateness Method)

1. The MSLT consists of five nap opportunities performed at two hour intervals. The initial nap opportunity begins 1.5 to 3 hours after termination of the nocturnal recording. A shorter four-nap test may be performed but this test is not reliable for the diagnosis of narcolepsy unless at least two sleep onset REM periods have occurred.
2. The MSLT must be performed immediately following polysomnography recorded during the individual's major sleep period. The use of MSLT to support a diagnosis of narcolepsy is suspect if TST on the prior night sleep is less than 6 hours. The test should not be performed after a split-night sleep study (combination of diagnostic and therapeutic studies in a single night).
3. Sleep logs may be obtained for 1 week prior to the MSLT to assess sleep-wake schedules.
4. Standardization of test conditions is critical for obtaining valid results. Sleep rooms should be dark and quiet during testing. Room temperature should be set based on the patient's comfort level.
5. Stimulants, stimulant-like medications, and REM suppressing medications should ideally be stopped 2 weeks before MSLT. Use of the patient's other usual medications (e.g., antihypertensives, insulin, etc.) should be thoughtfully planned by the sleep clinician before MSLT testing so that undesired influences by the stimulating or sedating properties of the medications are minimized. Drug screening may be indicated to ensure that sleepiness on the MSLT is not pharmacologically induced. Drug screening is usually performed on the morning of the MSLT but its timing and the circumstances of the testing may be modified by the clinician. Smoking should be stopped at least 30 minutes prior to each nap opportunity. Vigorous physical activity should be avoided during the day and any stimulating activities by the patient should end at least 15 minutes prior to each nap opportunity. The patient must abstain from any caffeinated beverages and avoid unusual exposures to bright sunlight. A light breakfast is recommended at least 1 hour prior to the first trial, and a light lunch is recommended immediately after the termination of the second noon trial.
6. Sleep technologists who perform MSLTs should be experienced in conducting the test.
7. The conventional recording montage for the MSLT includes central EEG (C3-A2, C4-A1) and occipital (O1-A2, O2-A1) derivations, left and right eye electrooculograms (EOGs), mental/submental electromyogram (EMG), and electrocardiogram (EKG).
8. Prior to each nap opportunity, the patient should be asked if they need to go to the bathroom or need other adjustments for comfort. Standard instructions for bio-calibrations (i.e., patient calibrations) prior to each nap include: (1) lie quietly with your eyes open for 30 seconds, (2) close both eyes for 30 seconds, (3) without moving your head, look to the right, then left, then right, then left, right and then left, (4) blink eyes slowly for 5 times, and (5) clench or grit your teeth tightly together.
9. With each nap opportunity the subject should be instructed as follows: "Please lie quietly, assume a comfortable position, keep your eyes closed and try to fall asleep." The same instructions should be given prior to every test. Immediately after these instructions are given, bedroom lights are turned off, signaling the start of the test. Between naps, the patient should be out of bed and prevented from sleeping. This generally requires continuous observation by a laboratory staff member.
10. Sleep onset for the clinical MSLT is determined by the time from lights out to the first epoch of any stage of sleep, including stage 1 sleep. Sleep onset is defined as the first epoch of greater than 15 sec of cumulative sleep in a 30-sec epoch. The absence of sleep on a nap opportunity is recorded as a sleep latency of 20 minutes. This latency is included in the calculation of mean sleep latency (MSL). In order to assess for the occurrence of REM sleep, in the clinical MSLT the test continues for 15 minutes from after the first epoch of sleep. The duration of 15 minutes is determined by "clock time", and is not determined by a sleep time of 15 minutes. REM latency is taken as the time of the first epoch of sleep to the beginning of the first epoch of REM sleep regardless of the intervening stages of sleep or wakefulness.
11. A nap session is terminated after 20 minutes if sleep does not occur.
12. The MSLT report should include the start and end times of each nap or nap opportunity, latency from lights out to the first epoch of sleep, mean sleep latency (arithmetic mean of all naps or nap opportunities), and number of sleep-onset REM periods (defined as greater than 15 sec of REM sleep in a 30-sec epoch).
13. Events that represent deviation from standard protocol or conditions should be documented by the sleep technologist for review by the interpreting sleep clinician.

L'MSLT consiste in cinque opportunità di dormire, ad intervalli di due ore.

1°

2 h

2°

2 h

3°

2 h

4°

2 h

5°

MSLT 1

2 h

h 07:00 FINE SONNO NOTTURNO

1°

h 09:00

L'MSLT consiste in cinque opportunità di dormire, ad intervalli di due ore.

2 h

2°

h 11:00

Il primo tentativo inizia da 1,5 a 3 ore dopo il termine del sonno notturno.

2 h

3°

h 13:00

2 h

4°

h 15:00

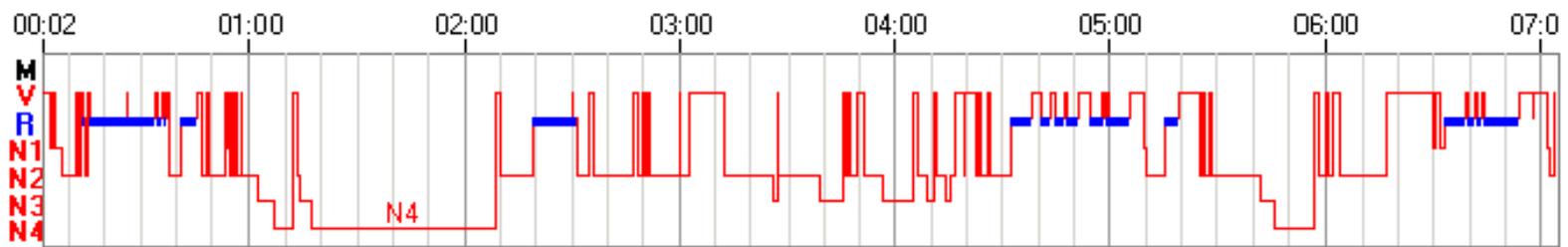
2 h

5°

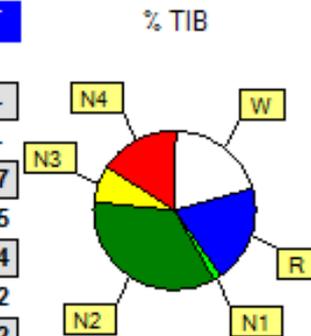
h 17:00

L'MSLT deve essere eseguito immediatamente dopo la Polisonnografia notturna, il cui TST non deve essere inferiore a 6 ore.

Stadi del sonno



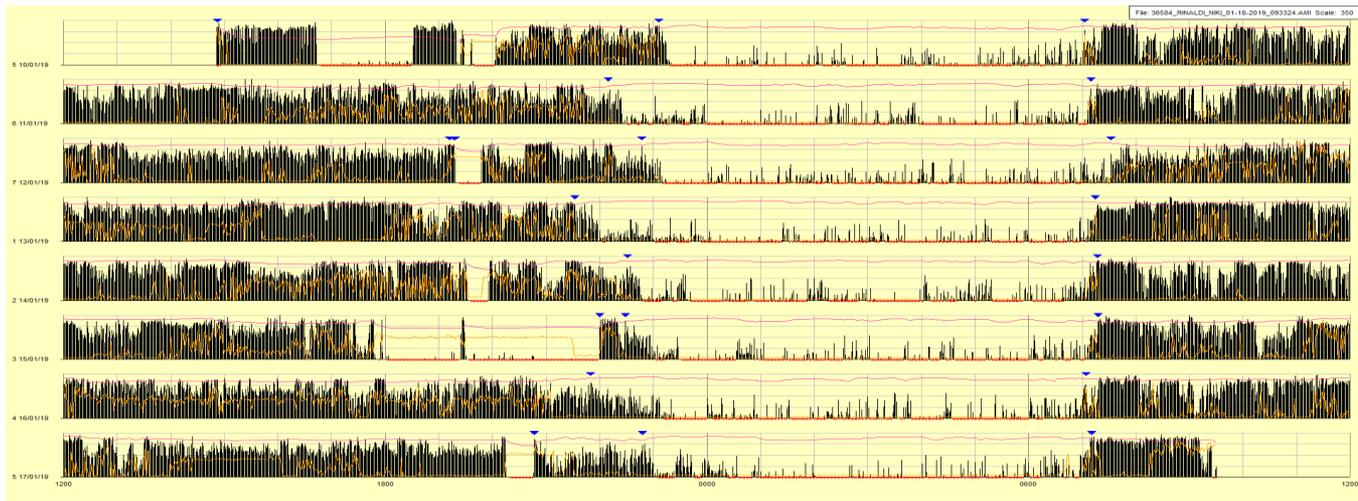
Tempo Totale di sonno (TST)	05:36:30	Stadio sonno	Durata	(%) TIB	(%) TST	(%) SPT
Efficienza del sonno [%]	79.8	Artefatto	-	-	-	-
Eff. sonno sost. [%]	80.5	Movimento	-	-	-	-
Latenza del sonno [m]	3.5	Veglia	01:24:59	20.2	-	19.7
Latenza del sonno N1 [m]	2.0	REM	01:25:30	20.3	25.4	20.5
Latenza del sonno N2 [m]	5.5	N1	00:07:00	1.7	2.1	1.4
Latenza sonno profondo [m]	60.5	N2	02:27:00	34.9	43.7	35.2
Latenza REM [m]	7.0	N3	00:30:00	7.1	8.9	7.2
Periodo totale di sonno (SPT)	06:58:00	N4	01:07:00	15.9	19.9	16.0
Variatz.stadi del sonno (Indice)	136 (19.4)	Sonno Legg.	02:34:00	36.5	45.8	36.6
Numero veglie (Indice)	56 (10.0)	Sonno Prof.	01:37:00	23.0	28.8	23.2
Num.Veglie >3 min (Indice)	7 (1.2)					
# Veglia resp. (Indice)	0 (0.0)					
Durata veglia SPT	01:22:30					
Densità REM [%]	2					
WASO	01:22:30					



Se si utilizza un diario del sonno, per il confronto con la PSG, è bene farlo la settimana precedente il MSLT.



Consegna		Cognome Name		n°Pol						
Restituzione										
		Data		L	M	M	S	V	S	D
		/ /		/	/	/	/	/	/	/
GIORNO	SONNELLINI	QUANTI	0 1 2 3 4 5	0 1 2 3 4 5	0 1 2 3 4 5	0 1 2 3 4 5	0 1 2 3 4 5	0 1 2 3 4 5	0 1 2 3 4 5	0 1 2 3 4 5
		DURATA COMPLESSIVA								
	SONNOLEZZA	0 per nulla - 5 molto	0 1 2 3 4 5	0 1 2 3 4 5	0 1 2 3 4 5	0 1 2 3 4 5	0 1 2 3 4 5	0 1 2 3 4 5	0 1 2 3 4 5	0 1 2 3 4 5
	EVENTI									
COMPILARE PRIMA DI CONCORDARE	BEVANDE ATTIVANTI	QUANTITÀ	0 1 2 3 4 5	0 1 2 3 4 5	0 1 2 3 4 5	0 1 2 3 4 5	0 1 2 3 4 5	0 1 2 3 4 5	0 1 2 3 4 5	0 1 2 3 4 5
	Caffè, tè, cola, bibite energy	ULTIMA A CHE ORA	:	:	:	:	:	:	:	:
NOTTE	FARMACI	COSA								
		A CHE ORA	:	:	:	:	:	:	:	:
	CORICATO	A CHE ORA	:	:	:	:	:	:	:	:
	SPENTA LUCE	A CHE ORA	:	:	:	:	:	:	:	:
	TEMPO PER ADDORMENTARSI	minuti								
	RISVEGLI NOTTURNI	A CHE ORA IL PRIMO	:	:	:	:	:	:	:	:
		QUANTI	0 1 2 3 4 5	0 1 2 3 4 5	0 1 2 3 4 5	0 1 2 3 4 5	0 1 2 3 4 5	0 1 2 3 4 5	0 1 2 3 4 5	
		QUANTO TEMPO IN TUTTO								
	RISVEGLIO MATTINA	A CHE ORA	:	:	:	:	:	:	:	:
	ALZATO DAL LETTO	A CHE ORA	:	:	:	:	:	:	:	:
SONNO RIPOSANTE	0 per nulla - 5 molto	0 1 2 3 4 5	0 1 2 3 4 5	0 1 2 3 4 5	0 1 2 3 4 5	0 1 2 3 4 5	0 1 2 3 4 5	0 1 2 3 4 5	0 1 2 3 4 5	



Per ottenere risultati validi e confrontabili è fondamentale che le condizioni ambientali siano standardizzate.

La Sala Sonno deve essere:

- Oscurabile
- Isolata acusticamente
- Climatizzata (In base alle esigenze del paziente).



La terapia assunta dal Paziente deve essere attentamente pianificata dal medico.



Il fumo dovrebbe essere interrotto almeno 30 minuti prima di ogni prova.

1° 09:00

2° 11:00

3° 13:00

4° 15:00

5° 17:00

La terapia assunta dal Paziente deve essere attentamente pianificata dal medico.



Il fumo dovrebbe essere interrotto almeno 30 minuti prima di ogni prova.

1° 09:00



Un'attività fisica intensa deve essere evitata durante il giorno.

2° 11:00

3° 13:00

4° 15:00

5° 17:00

La terapia assunta dal Paziente deve essere attentamente pianificata dal medico.



Il fumo dovrebbe essere interrotto almeno 30 minuti prima di ogni prova.

1° 09:00



Un'attività fisica intensa deve essere evitata durante il giorno.

2° 11:00



Qualsiasi attività stimolante da parte del paziente deve terminare almeno 15 minuti prima di ciascuna prova. (No comunicazioni spiacevoli)

3° 13:00

4° 15:00

5° 17:00

La terapia assunta dal Paziente deve essere attentamente pianificata dal medico.

- 1° 09:00  Il fumo dovrebbe essere interrotto almeno 30 minuti prima di ogni prova.
- 2° 11:00  Un'attività fisica intensa deve essere evitata durante il giorno.
- 3° 13:00  Qualsiasi attività stimolante da parte del paziente deve terminare almeno 15 minuti prima di ciascun prova. (No comunicazioni spiacevoli)
- 4° 15:00    Il paziente deve astenersi da eventuali bevande contenenti caffeina ed evitare esposizioni alla luce solare intensa.
- 5° 17:00

La terapia assunta dal Paziente deve essere attentamente pianificata dal medico.

- 1° 09:00  Il fumo dovrebbe essere interrotto almeno 30 minuti prima di ogni prova.
- 2° 11:00  Un'attività fisica intensa deve essere evitata durante il giorno.
- 3° 13:00  Qualsiasi attività stimolante da parte del paziente deve terminare almeno 15 minuti prima di ciascun prova. (No comunicazioni spiacevoli)
- 4° 13:00    Il paziente deve astenersi da eventuali bevande contenenti caffeina ed evitare esposizioni alla luce solare intensa.
- 4° 15:00
- 5° 17:00  Si consiglia:
 -una colazione leggera almeno 1 ora prima della prima prova,
 -un pranzo leggero dopo la conclusione della seconda prova.

Il monitoraggio Polisonnografico prevede:

- EEG C3-A2
C4-A1
O1-A2
O2-A1
- EOG destro e sinistro
- EMG del muscolo miloioideo
- ECG

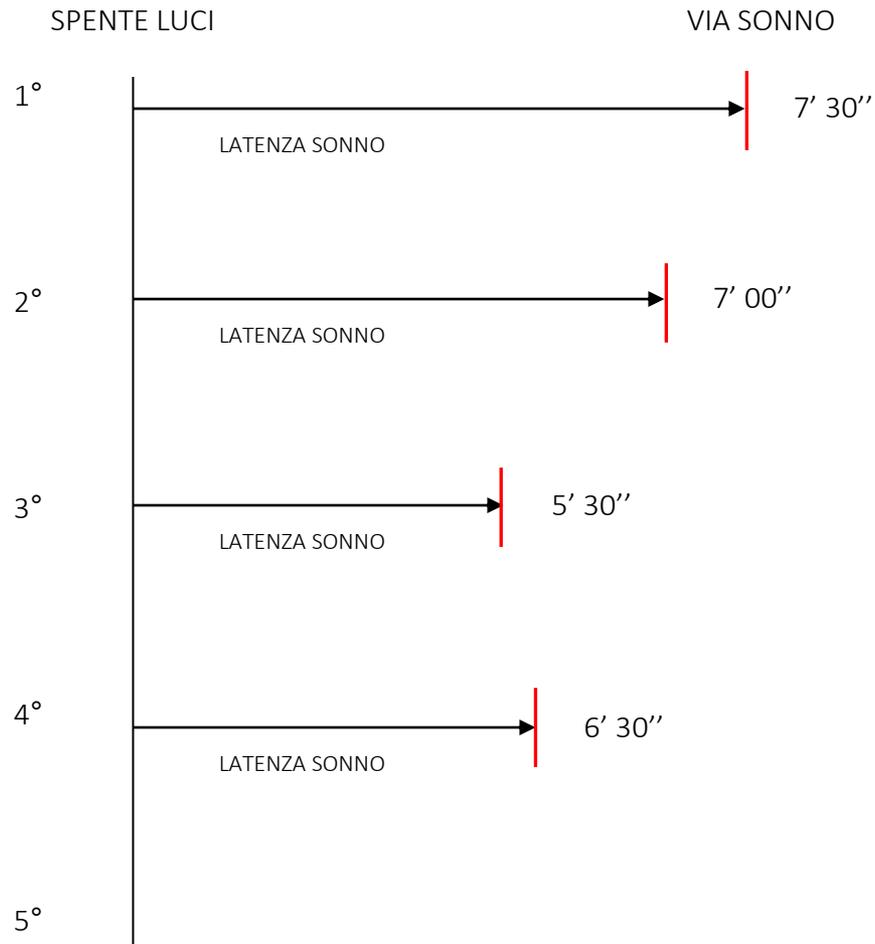
Prima di ogni prova il Paziente, sdraiato a letto, riceve le seguenti istruzioni:

“Per favore rimanga in silenzio, assuma una posizione comoda, tenga gli occhi chiusi e **cerchi di addormentarsi**”.

Immediatamente dopo aver dato queste istruzioni le luci della sala sono vengono spente de ha inizio la prova.



La Latenza Sonno (Sleep Latency) è data dal tempo che intercorre tra lo Spente Luci ed il Via Sonno (Sleep Onset).



Il Via Sonno (Sleep Onset) viene identificato con la prima epoca di qualsiasi fase di sonno, incluso il sonno N1.

00.30	01.00	01.30	02.00	02.30	03.00	03.30	04.00	04.30	05.00	05.30	05.30	05.30
W	W	1	W	W	W	1	1	W	W	1	1	1

↑

via sonno 1 epoca

↑

via sonno 2 epoche

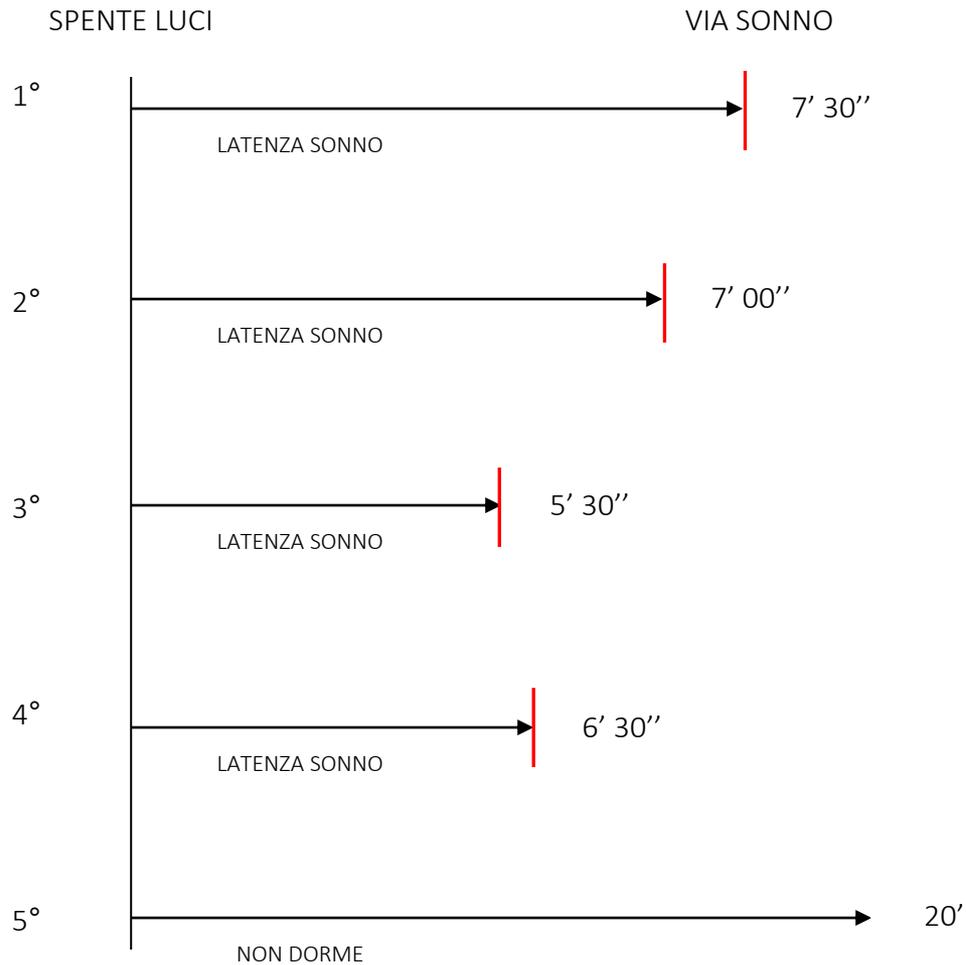
↑

via sonno 3 epoche

American Academy of Sleep Medicine AASM

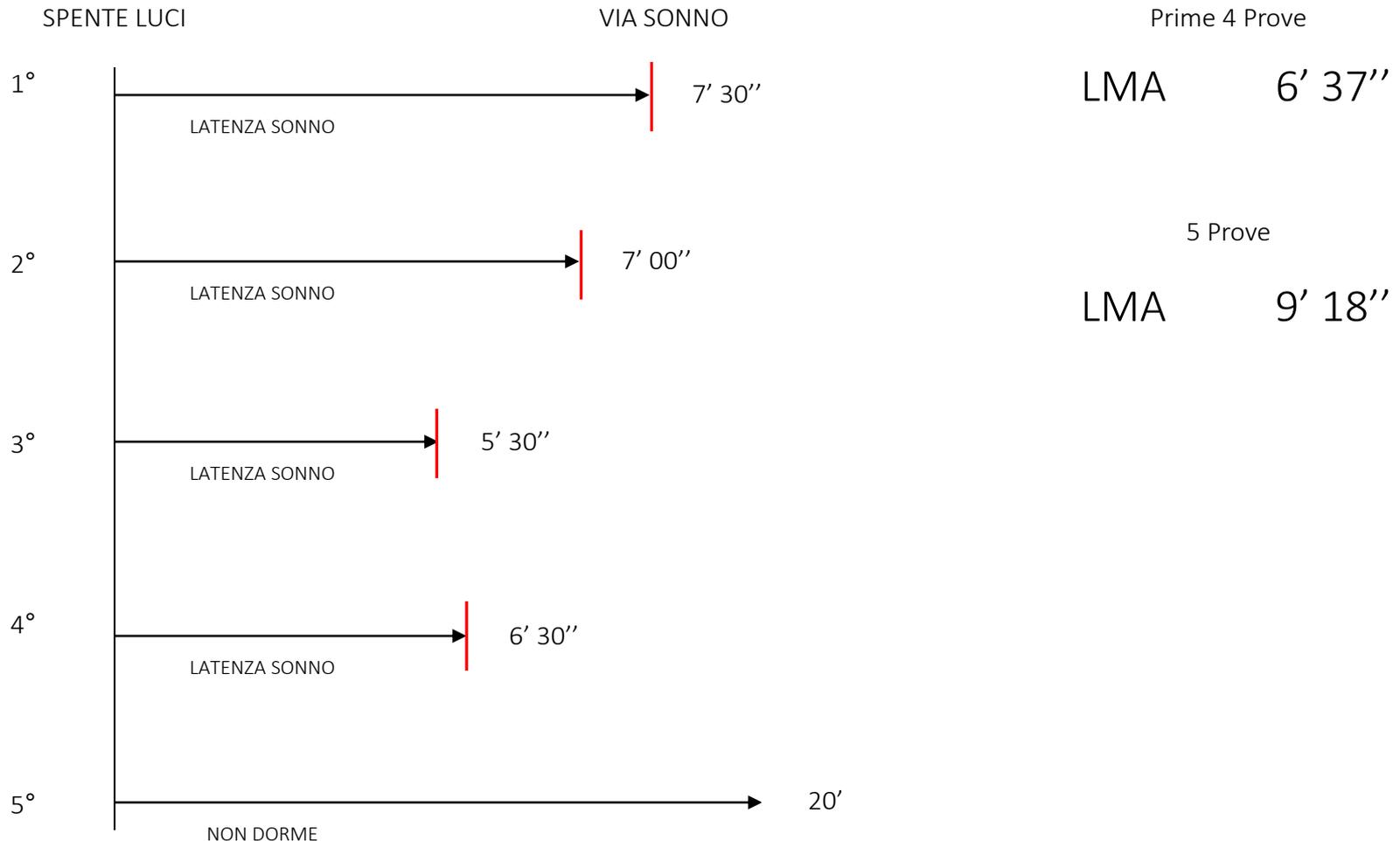
SLEEP, Vol. 28, No. 1, 2005

Se in una prova il paziente non dorme viene considerata una Latenza Sonno di 20'.



Se in una prova il paziente non dorme viene considerata una Latenza Sonno di 20'.

Questa latenza deve essere inclusa nel calcolo della Latenza Media di Addormentamento (LMA).



Se in una prova il paziente non dorme viene considerata una Latenza Sonno di 20'.

Questa latenza deve essere inclusa nel calcolo della Latenza Media di Addormentamento (LMA).

LMA	< 8' Patologica
	>10' Fisiologica

Dopo la prima epoca di sonno la prova continua per 15 minuti,



La latenza REM è il tempo che intercorre dalla prima epoca di sonno alla prima epoca del sonno REM.
Indipendentemente dalle fasi intermedie di sonno o di veglia.



Anche se il sonno REM si presenta prima dei 15' (SOREMP – sleep onset REM period) la prova continua fino allo scadere del tempo previsto.

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A normative study of the maintenance of wakefulness test (MWT)

Karl Doghramji^{a,*}, Merrill M. Mitler^b, R. Bart Sangal^c, Colin Shapiro^d, Sheila Taylor^e, Joyce Walsleben^f, Cynthia Belisle^c, Milton K. Erman^b, Rosa Hayduk^b, Rima Hosn^d, Edward B. O'Malley^f, JoAnne M. Sangal^c, Sharon L. Schutte^a, and James M. Youakim^a

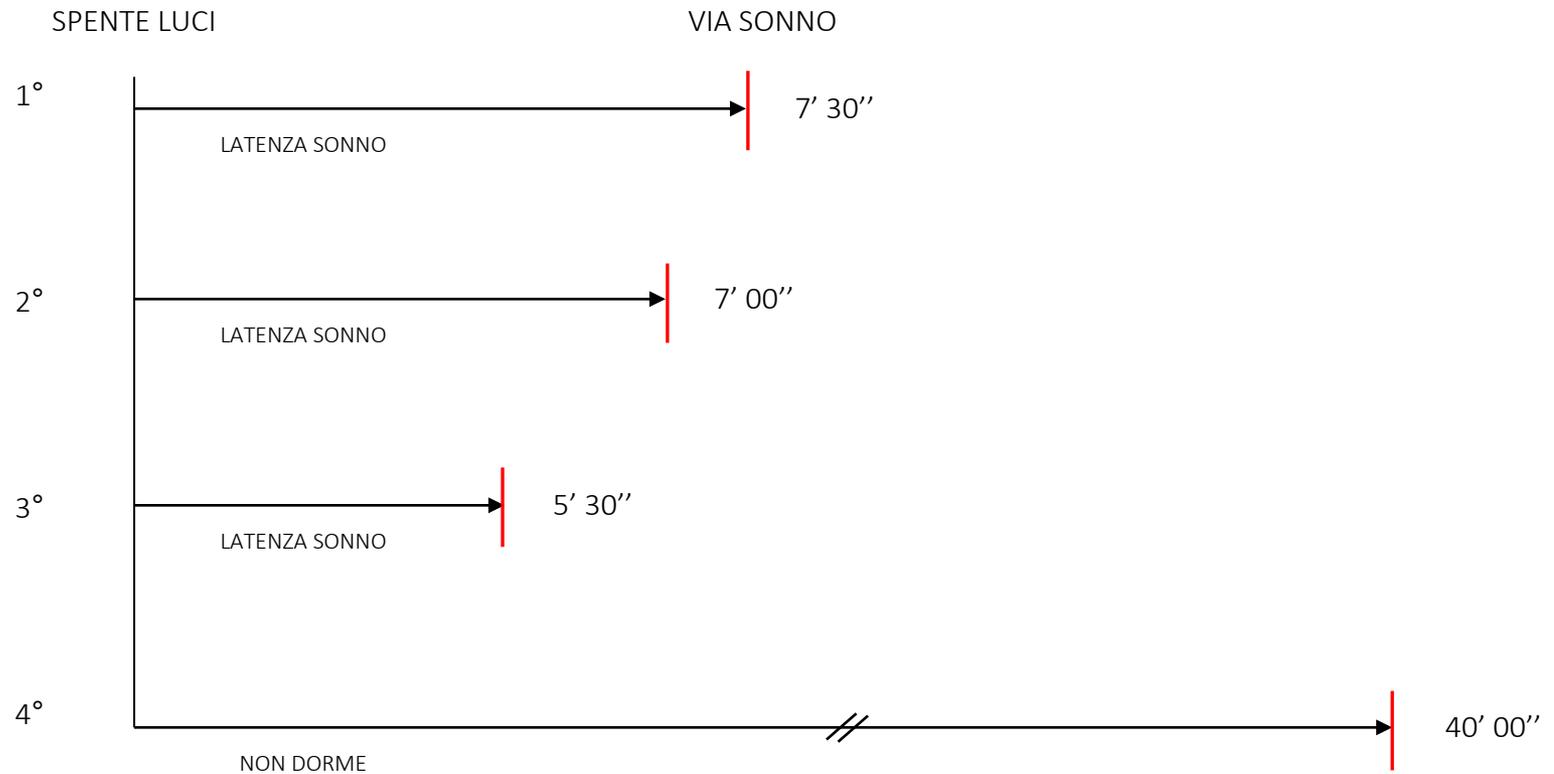


Le istruzioni per il paziente sono le seguenti:

“Per favore, rimanga fermo e **resti sveglio il più a lungo possibile.**
Guardi dritto davanti a se, e non guardi direttamente la luce.”



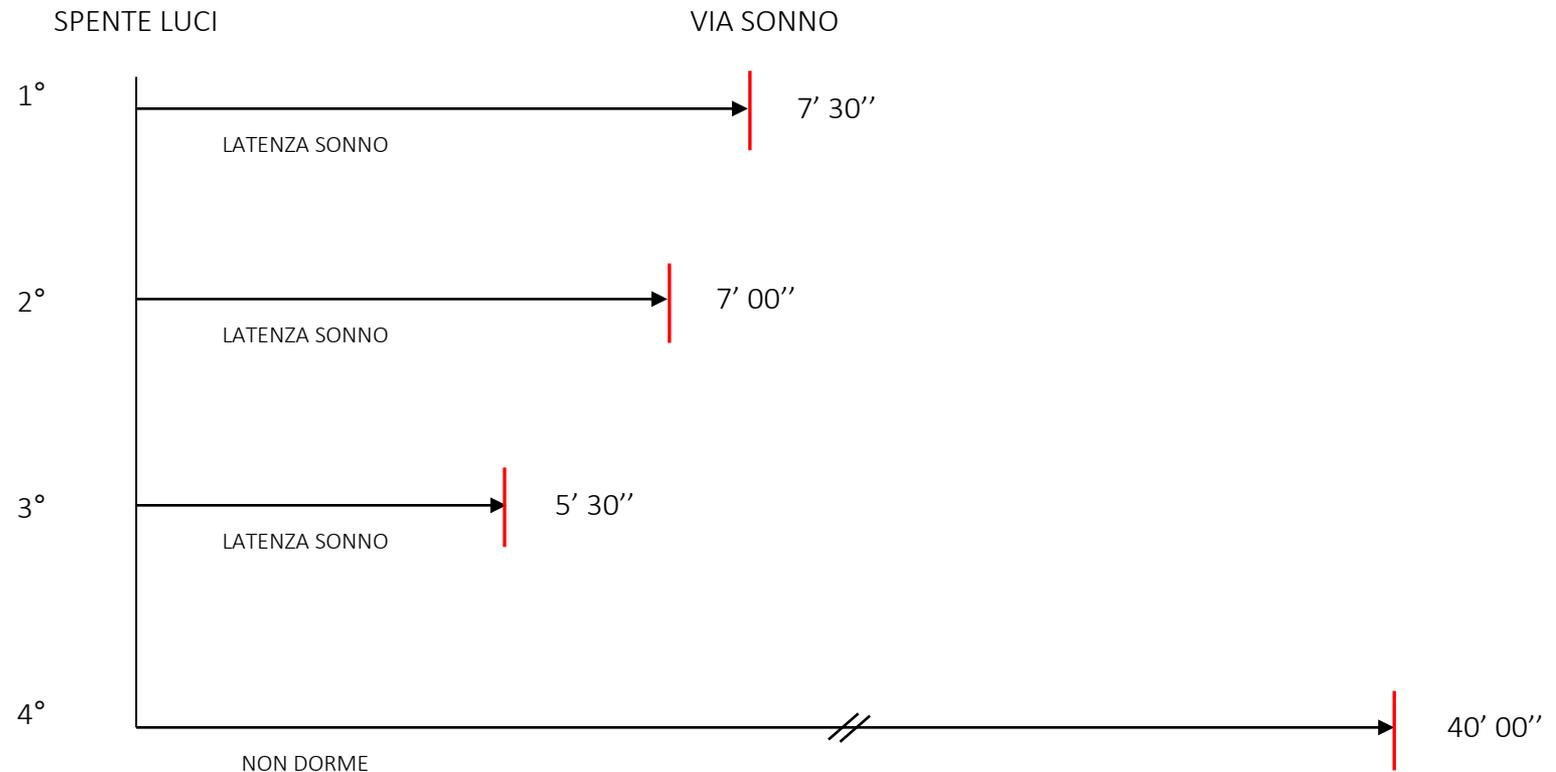
L'inizio del sonno è definito come la prima epoca di sonno.



LMA

Media aritmetica 4 Latenze Sonno

L'inizio del sonno è definito come la prima epoca di sonno.



LMA

< 8' Patologica

>30' Fisiologica

Practice Parameters for the Indications for Polysomnography and Related Procedures: An Update for 2005

Clete A. Kushida, MD, PhD¹; Michael R. Littner, MD²; Timothy Morgenthaler, MD³; Cathy A. Alessi, MD⁴; Dennis Bailey, DDS⁵; Jack Coleman, Jr., MD⁶; Leah Friedman, PhD⁷; Max Hirshkowitz, PhD⁸; Sheldon Kapen, MD⁹; Milton Kramer, MD¹⁰; Teofilo Lee-Chiong, MD¹¹; Daniel L. Loube, MD¹²; Judith Owens, MD¹³; Jeffrey P. Pancer, DDS¹⁴; Merrill Wise, MD¹⁵

Sleep-related breathing disorders (OSAS, obesity hypoventilation syndrome, patients with neuromuscular disorders)

CPAP or BiPAP titration,

Assessment of treatment after CPAP therapy or after oral appliances or surgery, follow up PSG if significant changes in symptoms or weight occur

Suspected narcolepsy (overnight PSG followed by MSLT)

Parasomnias: unexplained nocturnal awakenings, unusual behavioral events in sleep like sleep terror, REM behavior disorder or DD for seizure and a sleep disorder

Periodic limb movement in sleep

Insomnias (if suspected to have sleep apnea or PLMS, failure of an adequate behavioral or pharmacological treatment)

MSLT will be required in suspected narcolepsy and unexplained daytime drowsiness

MWT should be performed to detected response to continuous positive airway pressure (CPAP) therapy or EDS medications