

# **EDF and EDF+**

**Bob Kemp**

**Leiden University, Neurology  
Westeinde Hospital, Sleep Centre**

**bk@hsr.nl**

# **EDF**

**3-page specification, 1992 (handout)**

**Biosignals, and analyses like deltaplots**

**Mainly used for PSG and EEG**

**50 companies, many researchers**

# **EDF+**

**7-page specification, 2003 (handout)**

**EDF+: better EDF plus annotations, events**

**Used for PSG, EEG, EP, EMG, Actigraphy, Sleep stages, Apnea's, Cardiology**

**Software and recordings available**

# The EDF / EDF+ file

<b>General header</b>	<b>ASCII characters</b>
version of this data format (still 0)	8
patient identification (de-identification here)	80
recording identification	80
startdate of the recording, like 27.01.06	8
starttime of the recording, like 23.12.00	8
technical checksum	8
reserved	44
number of data records with PSG signals	8
duration of each data record	8
number of signals	4
<b>Signals header, for each signal</b>	<b>ASCII characters</b>
signal label, like EEG C3-A2	16
transducertype, like AgAgCl electrode	80
physical dimension, like uV	8
amplitude calibration (offset and gain)	32
prefiltering	80
sampling frequency	8
reserved	32
<b>Data records</b>	<b>16-bit integers</b>
samples of signal[1]	
samples of signal [2]	
...	

# EDF+ is more rigid than EDF

**patient ID** : HospitalCode | Sex | Birthdate | Name

**record ID** : Date | Investigation | Investigator | Equipment

**signal label** : like "EEG C3-A2" or "SaO2"

**dimension** : like "uV" or "mV" or "%"

# **EDF+ extra's**

## **Annotations**

**Interrupted recordings in one file (EP, EMG, MSLT)**

**Standard filenames for PSGs, deltaplots, sleep scores, ..**

**Compression of floats (0.5% accuracy)**

# EDF+ Annotations

The “Annotations signal” has text, not integers

**Text: Starttime | Duration | Annotation**

**Any language (UCS), for example +130.3 | 32.2 | ¥€\$**

**Pre-defined standard texts for Sleep scoring.**

**Applications: Free text, Sleep scores, QRS parameters,  
Stimuli, Events, ...**

# **EDF / EDF+ compatibility**

**EDF software reads EDF+, except events**

**EDF+ software reads EDF**



# Conference checklist: EDF+

**One recording file. Analysis-filename standard.**

**Fixed Patient information, linked to Hospital ID.  
Easy de-identification (beware annotations).**

**Sampling freq, bits, events: yes, [yes/no], yes**

**Events: any, new, [linked to channel,] overlapping.  
No referencing between events.**

**% SaO<sub>2</sub>, kPa pressure go in EDF and EDF+**

**AHI, TST go in EDF+.**

# [www.hsr.nl/edf](http://www.hsr.nl/edf)

## Lists of

**Companies**

**Specifications**

**Developers**

**Programming  
guidelines**

## Free downloads

**EDF checker**

**EDF(+) viewer**

**PSG's (Physionet)**

**EMG, EP, EEG, ..**

**Calibration test**

# EDF(+) companies

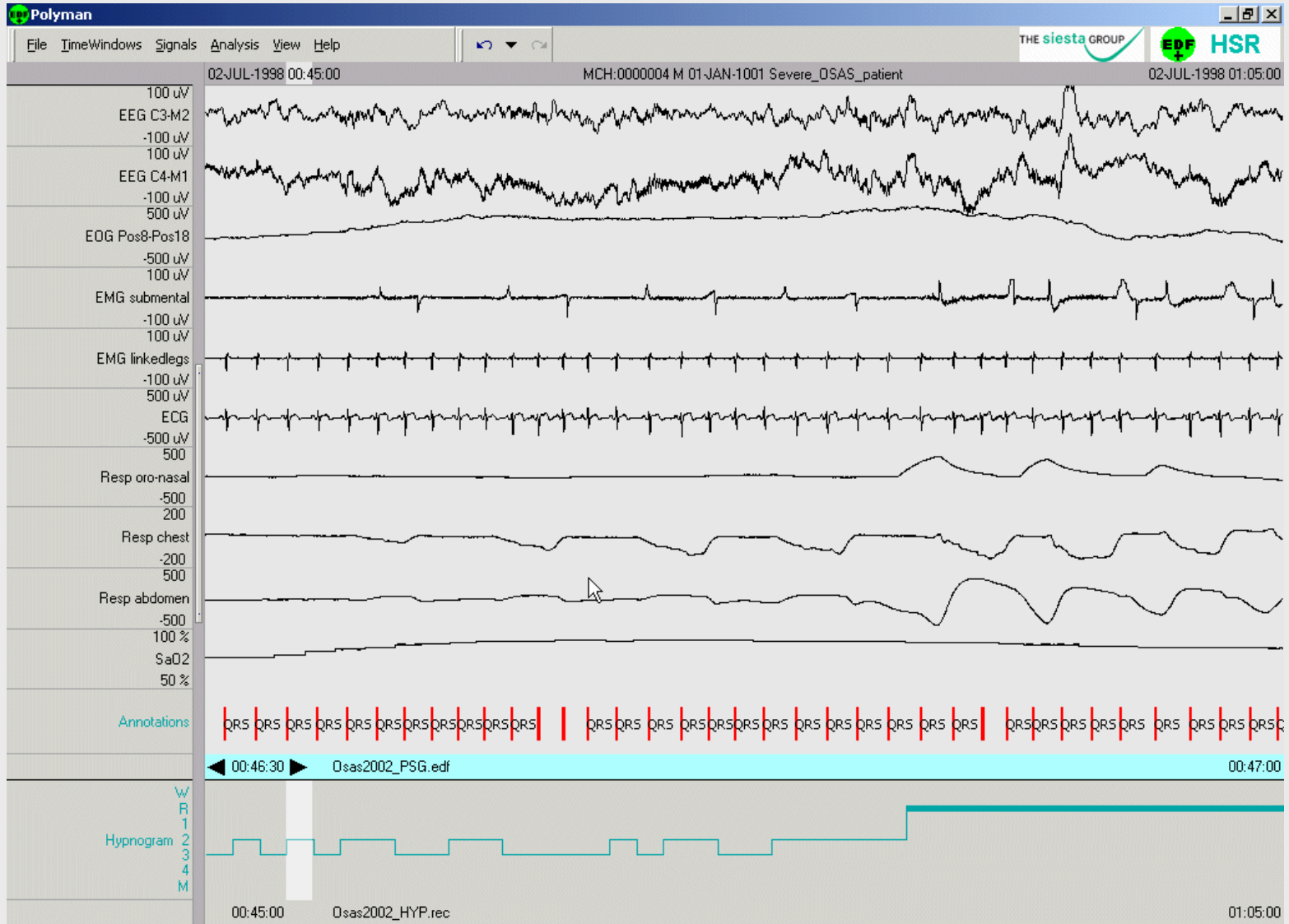
<p> <b>ANT, Netherlands.</b>  <b>Astro-Med, USA.</b>  <b>Ates, Italy.</b>  <b>BEST, Austria.</b>  <b>BioEra.</b>  <b>Bionic, France.</b>  <b>BioSemi, Netherlands.</b>  <b>Braebon, Canada.</b>  <b>BrainProducts, Germany</b>  <b>Cadwell, USA.</b>  <b>Cambridge, UK.</b>  <b>Compumedics, Australia</b>  <b>Danatech, USA.</b>  <b>Deltamed, France.</b>  <b>EBNeuro, Italy.</b>  <b>Eemagine, Germany.</b> </p>	<p> <b>Eldith, Germany.</b>  <b>Grass, U.S.A.</b>  <b>Guger, Austria.</b>  <b>Jaeger, Germany.</b>  <b>Judex, Denmark.</b>  <b>Kissei, USA.</b>  <b>Lifelines, UK.</b>  <b>MAP , Germany.</b>  <b>MBN, Russia.</b>  <b>Medatec, Belgium.</b>  <b>Medcare, Euro/USA</b>  <b>MediCel, Greece.</b>  <b>Medistar, Slovenia</b>  <b>Megis, Germany.</b>  <b>MKE, Germany.</b>  <b>Micromed, Italy.</b> </p>	<p> <b>Mindfield, Germany.</b>  <b>Neuroscan, USA.</b>  <b>Neurosoft, Russia.</b>  <b>Neurotraces, Spain.</b>  <b>Neurotronics, USA.</b>  <b>Nova Tech EEG, USA.</b>  <b>OpenXDF, USA.</b>  <b>OSG, Belgium.</b>  <b>Oxford Biosignals, UK.</b>  <b>Oxford Instruments, UK</b>  <b>Pentatek, Argentine.</b>  <b>Persyst, USA.</b>  <b>Puritan Bennett, Canada.</b>  <b>Respironics, USA.</b>  <b>Sagura, Germany.</b>  <b>Schwarzer, Germany.</b> </p>	<p> <b>Sensormedics, USA.</b>  <b>Sigma, Germany.</b>  <b>SignalLab, Yugoslavia.</b>  <b>SOMNOMedics, Germany.</b>  <b>SSI, USA.</b>  <b>Stellate, Canada.</b>  <b>Stowood, United Kingdom.</b>  <b>Taugagreining, Iceland.</b>  <b>The Siesta Group, Europe.</b>  <b>TEMEC, Netherlands.</b>  <b>Twente, Netherlands.</b>  <b>Viasys, USA.</b>  <b>Walter Graphtek, Germany.</b>  <b>XLTEK, USA.</b> </p>
---	--	--	--

# EDF checker

FileHeader		Signal Header for signal 1	
Version	<input type="text" value="0"/>	SignalLabel	<input type="text" value="EEG Fpz-M2"/>
Patient	<input type="text" value="MCH:0000004 M 01-JAN-1001 Severe_OSAS_p"/>	TransducerType	<input type="text" value="AgAgCl electrodes"/>
Recording	<input type="text" value="Startdate 02-JUL-1998 PSG:0000/00 MT NihonK"/>	PhysiDim	<input type="text" value="µV"/>
StartDate	<input type="text" value="02/07/98"/>	PhysiMin	<input type="text" value="-2888.76"/>
StartTime	<input type="text" value="00.45.00"/>	PhysiMax	<input type="text" value="2888.561"/>
HeaderBytes	<input type="text" value="4608"/>	DigiMin	<input type="text" value="-32768"/>
Reserved	<input type="text" value="EDF+C"/>	DigiMax	<input type="text" value="32767"/>
NrDataRecords	<input type="text" value="120"/>	PreFilter	<input type="text" value="BP:0.16-35Hz"/>
SampleRecDuration	<input type="text" value="10"/>	NrSamples	<input type="text" value="1000"/>
NrSignals	<input type="text" value="17"/>	Reserved	<input type="text"/>

**File is not a valid EDF file**

# EDF(+) viewer



# **We need a common data format**

**PSG archive independent from manufacturer**

**PSG analyser independent from PSG recorder**  
**best analyzer and best recorder**  
**one software for all recorders**  
**multicenter trials with central scoring**  
**inter-laboratory collaboration**

**Compatibility with EEG and Psychometry**

# We need a simple data format

**Small companies, limited capacity**

**Research groups, limited capacity**

**Implementing simple EDF has enough bugs**