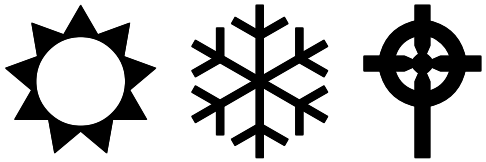


Metering Techniques

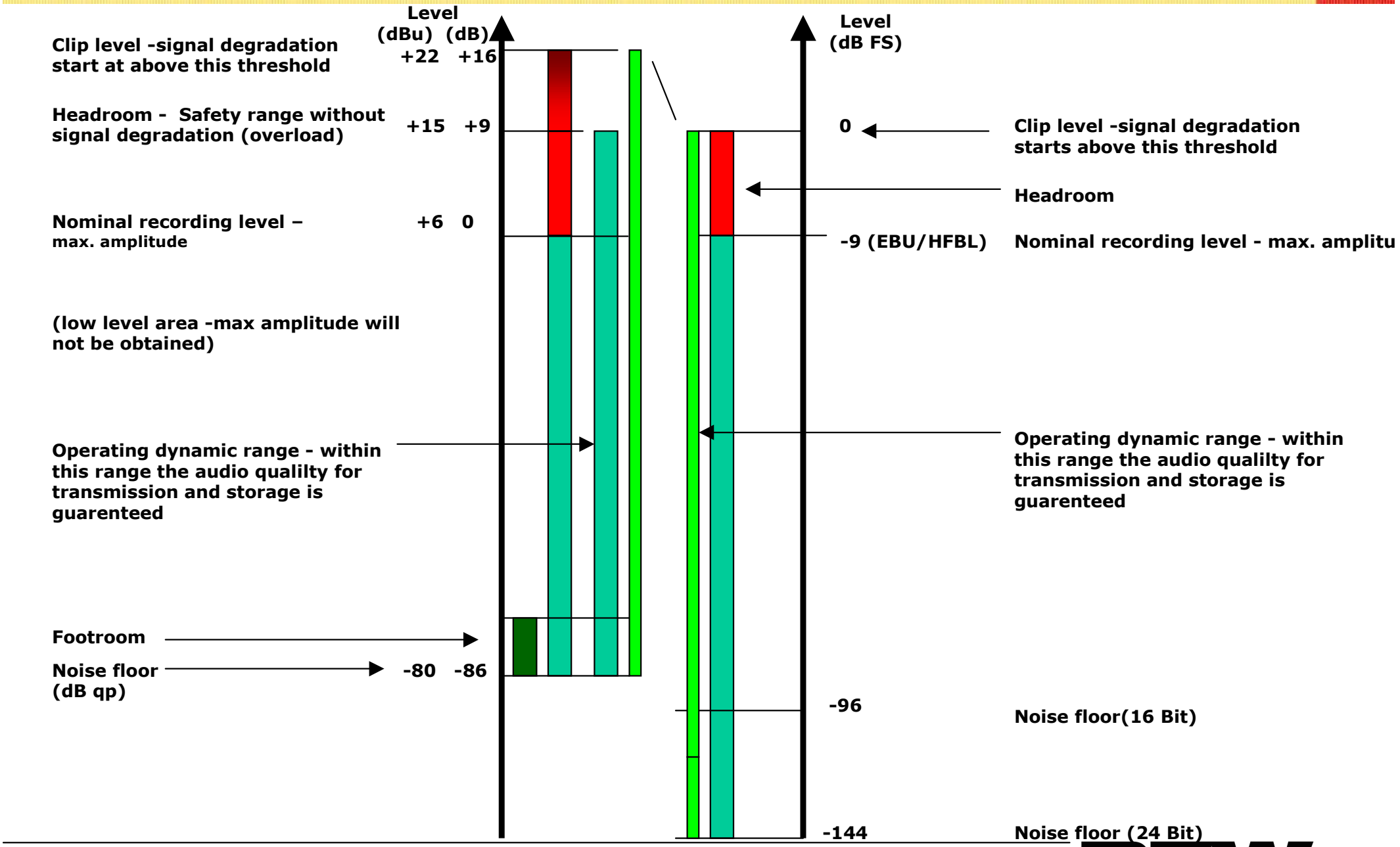
Metering Instruments

Monitoring

Agenda

- A-1. Metering - Terms - Definitions
- A-2. User requirements - type of application
- A-3. At present available and feasible types of display media
- A-4. Principal functioning of RTW PPM´s
- A-5. Differences in Standards
- A-6. Standard (Pflichtenheft) for analog PPM´s
- A-7. Standard (Pflichtenheft) for digital PPM´s
- A-8. Loudnessdisplay
- A-9. Correlator
- A-10. Goniometer - Vectorscope
- A-11. Surround Analyzer
- A-12. Monitoring
- A-13. Measuring techniques

Terms and Definitions



Type of application problem - 1

- **Level Meter**
  - To avoid overloads or clipping in the electronic circuitry, at the recorder and its media or during radio- and tv transmissions
  2. To judge correctly and fully use the dynamic range of the present equipment
     - Headroom and SNR – Signal to Noise Ratio
  3. To guarantee „nominal operating level“ for national and international program exchange
     - Standards
  4. DC -components
- **Correlation Meter**
  5. Compatibility
     - Stereo → Mono and Surround
- **AES - Analyzer A**
  6. Status- and other information
- **AES - Analyzer B**
  7. Carrier signal information

Type of application problem - 2

- **Spectrum Analyzer** — **8. Maximum utilisation of frequency spectrum - audible range and transmission range**
- **Vectorscope** — **9. Visualisation of the spacial impression**
- **Surround Analyzer** — **10. Visualisation of the spacial impression**
- **Level Statistics** — **11. Control and Supervision**
- **Loudness** — **12. Consideration of Loudness - Dialnorm**
- **Monitoring** — **13. Control room speaker management**

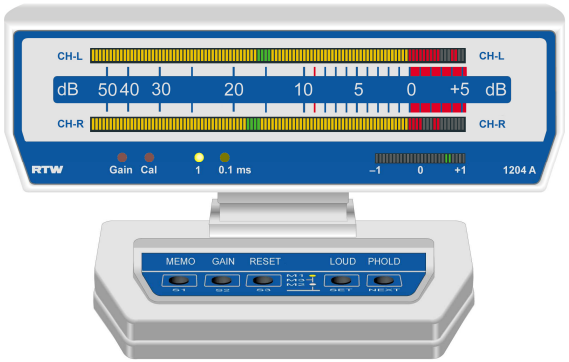
Display types - 1

- **Moving Coil**
  (special version Light Pointer)

  Moving coil with ancillary rectifier
  + cheap
  - slow (inertia resistance)
  - small display area

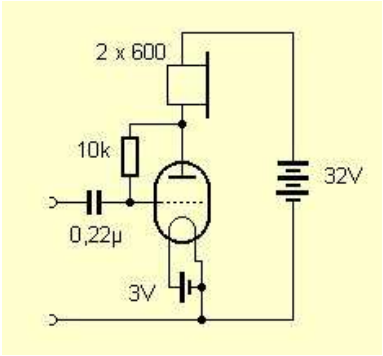
- **LED**

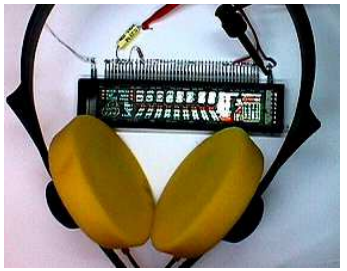
  + bargraph with no inertia resistence
  + multicolor possible
  - limited resolution
  *** monochrome, can be tiring**
  *** variation in brightness**
  *** mechanical problems in production**



- **Fluorescent display**

  Principle of the „magic eye"
  + no inertia resistence
  - production is complicated and expensive
  - tends to shading
  - monochrome, can be tiring
  + „can be used as an amplifier ....."





RTW

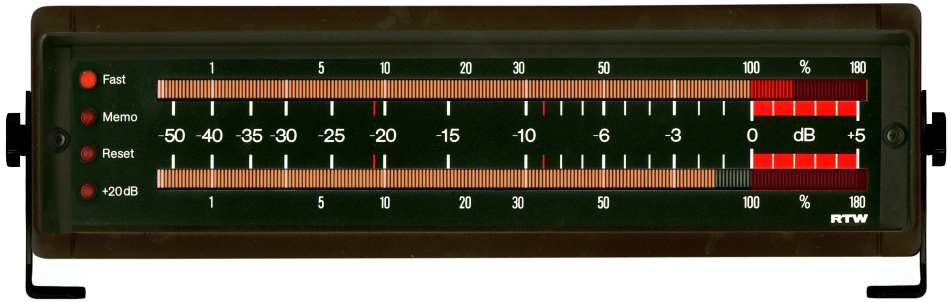
Display types - 2

Digital Display

Numerical level display
+ accurate
- no tendencies visible

Gas-Plasma-Display

+ good contrast
+ good viewing angle
+ low power consumption
+ long life time
+ no inertia resistence
- expensive compared to pointing device
- high anode voltage



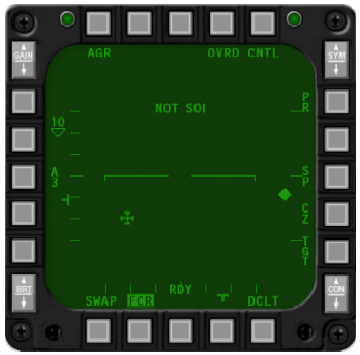
PC Monitor with or without PC

+ no inertia resistence
+ plug in for existing application software
+ high variety of different designs and sizes
- Plug in takes computing power
- Display takes „window space"

Display types - 3

LCD - Liquid-Chrystal-Display

+ single addressable segments
+ DOT-matrix and bargraph in mixed mode
+ no high voltage required
+ more or less no power consumption
+ colors selectable
+ flicker free
+ high life time
- expensive
- backlight required
- viewing angle problems
- low refresh rate

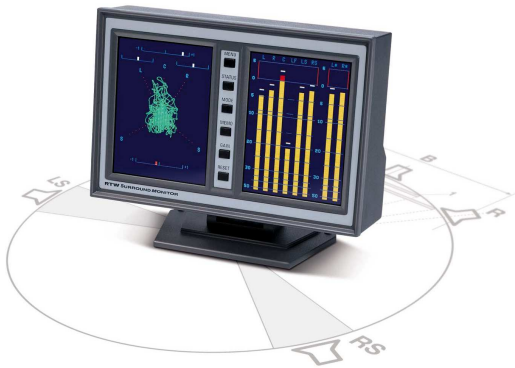


Single Color MFD

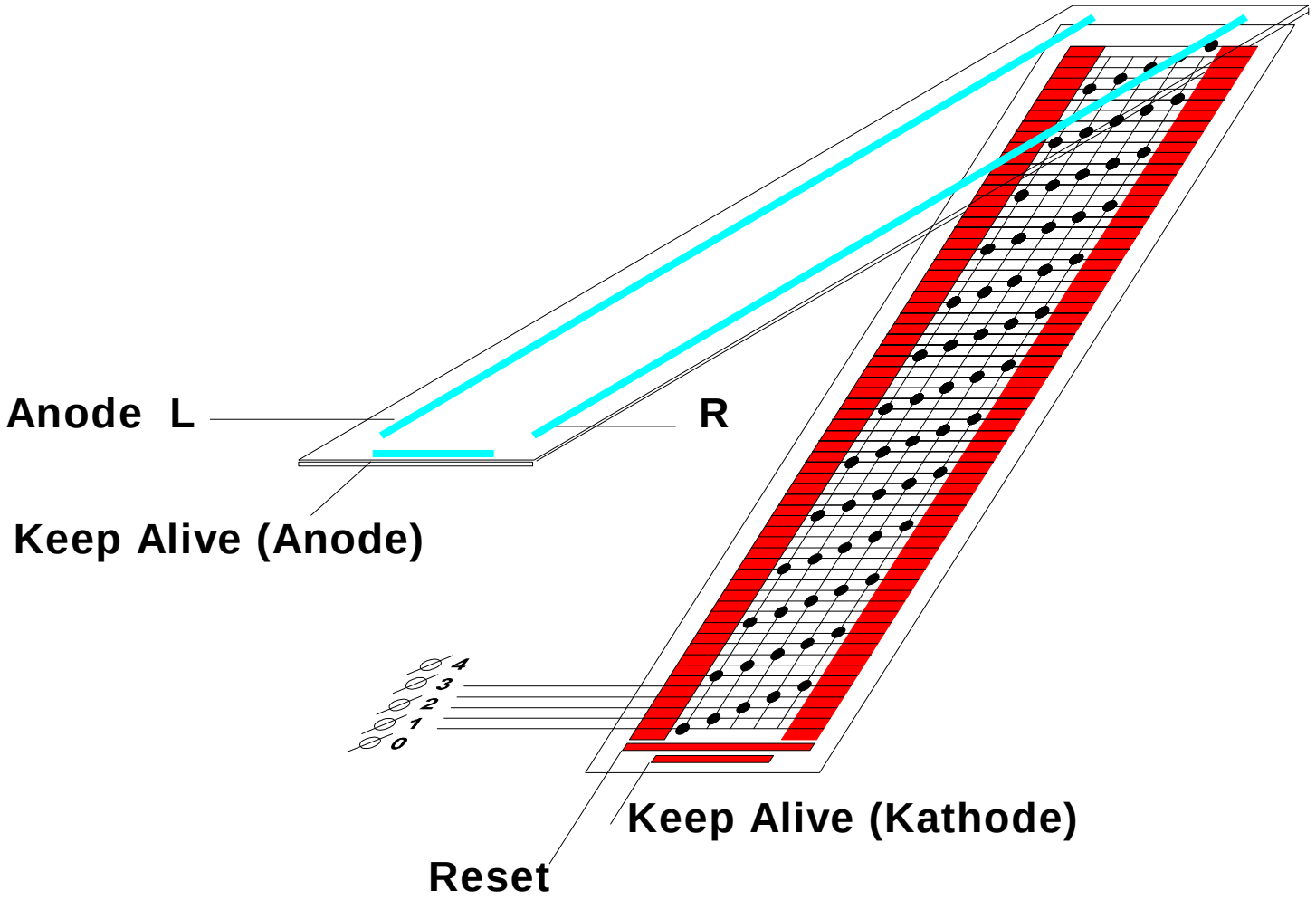
Multi Color MFD

TFT

+ compact units with backlight
+ text and graphic with definable color
+ no high voltage required
+ more or less no power consumption
+ flicker free
+ high life time
* expensive
* viewing angle problems

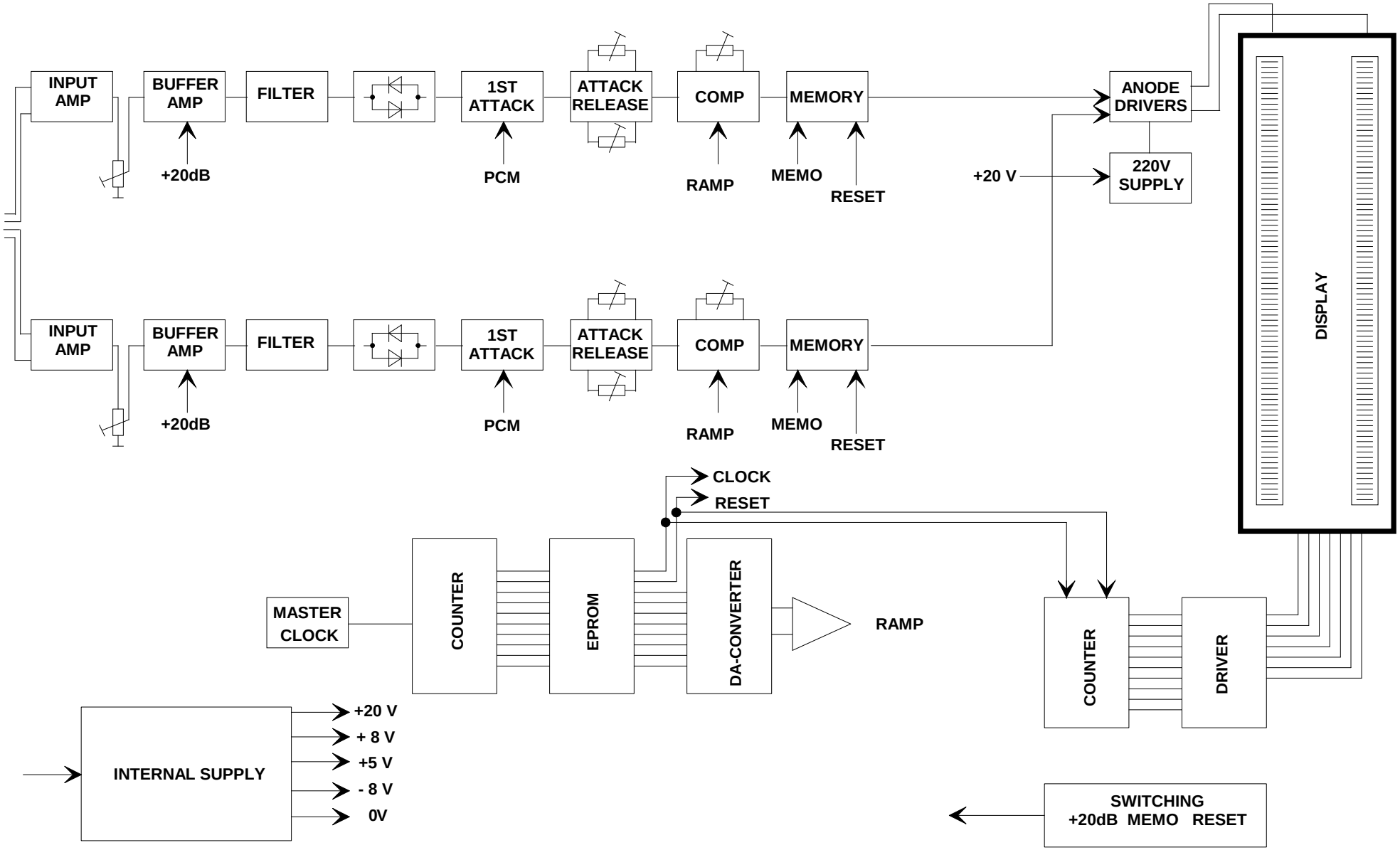


Principal functioning of a Gas-Plasma-Display

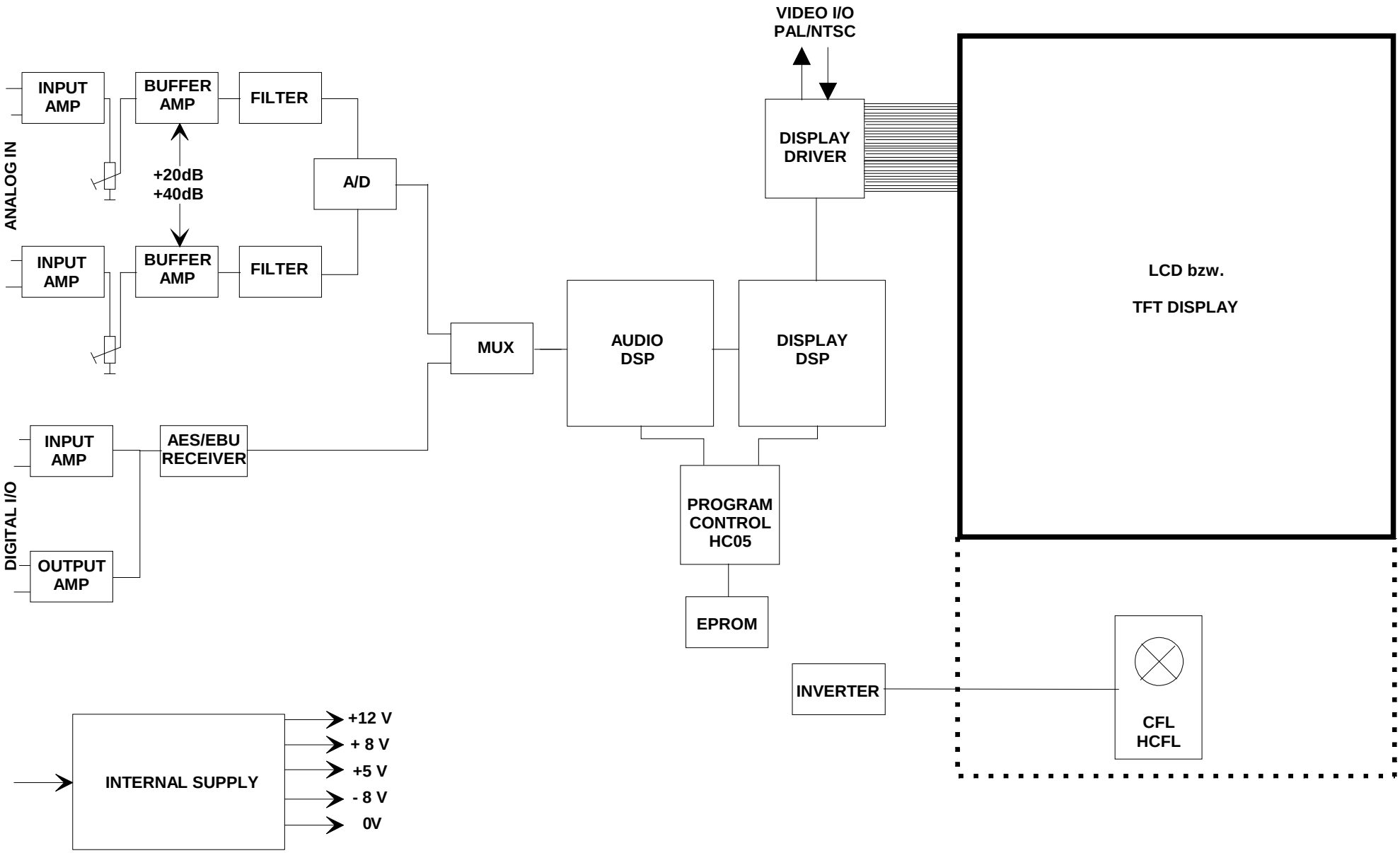


Example of a 5-phase display (as used in i.e. 1119 G)

Block diagram of an analog Peakmeter



Block diagram of a Vectorscope



Standards

- **VU 300 msec / US(185 nWb/m) / French 320 nWb/m)**

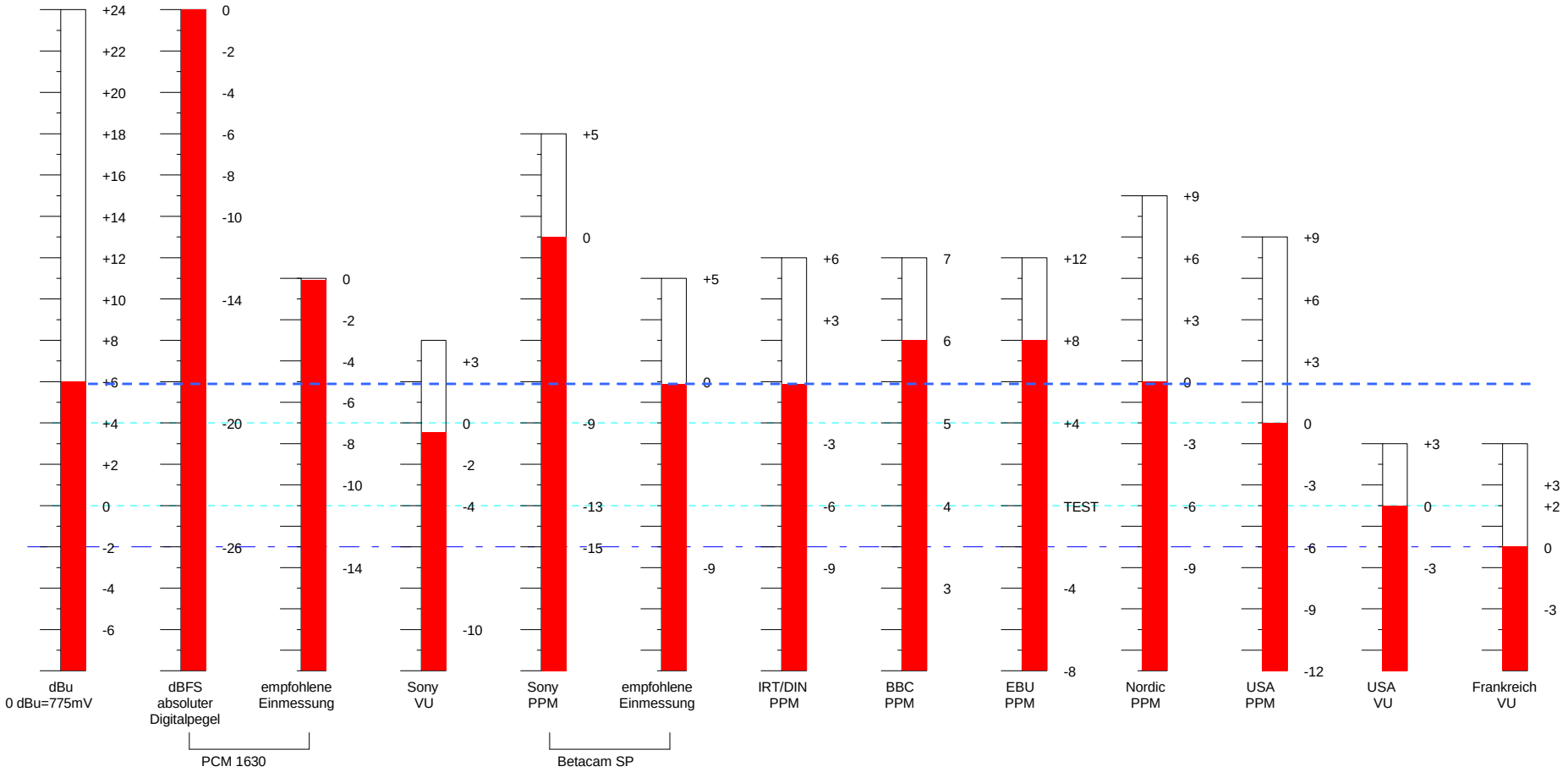
- **DIN 45406 / Pflichtenheft 3/6**
- **Arte (modified DIN 45406 7 dB Offset)**
- **French Cinema (modified DIN 45406 4 dB Offset)**

- **British IEC 268-10 Type IIA / IEC 268-10 Type IIB**

- **Nordic IEC 268-10 Type I / N9**

- **EBU-PPM R68**
- **US PPM**
- **US Film**
- **[Sony] Beta SP /Beta Digital / French Beta Digital**

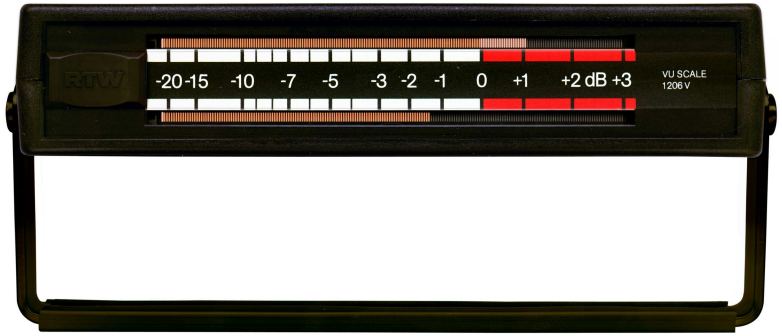
International Level Standards



Differences in Standards – 1 -

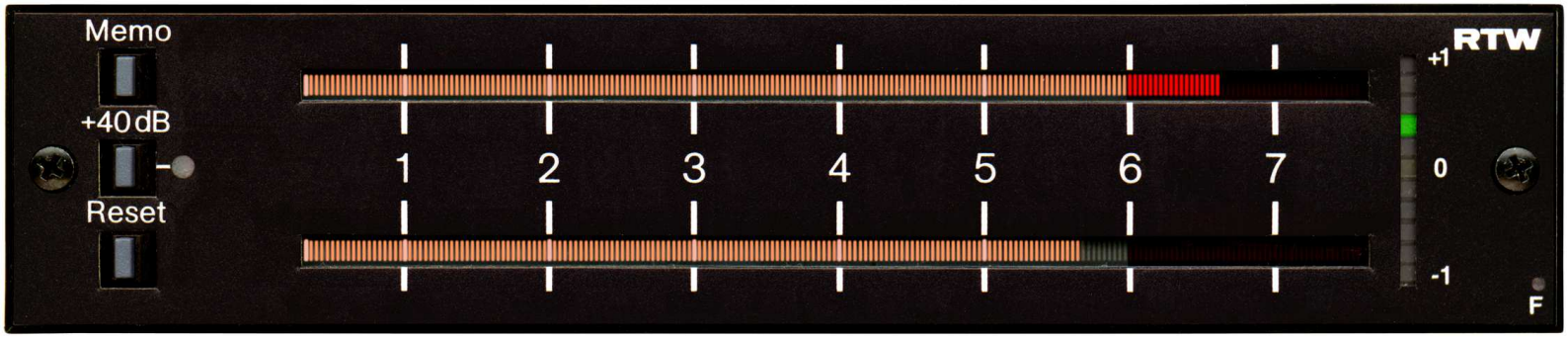
- **VU**

- Display type: similar to average display
- Integration time: 300 msec
- Release time -20dB: 300 msec
- Display range: -20 to +3 dB



- **British**

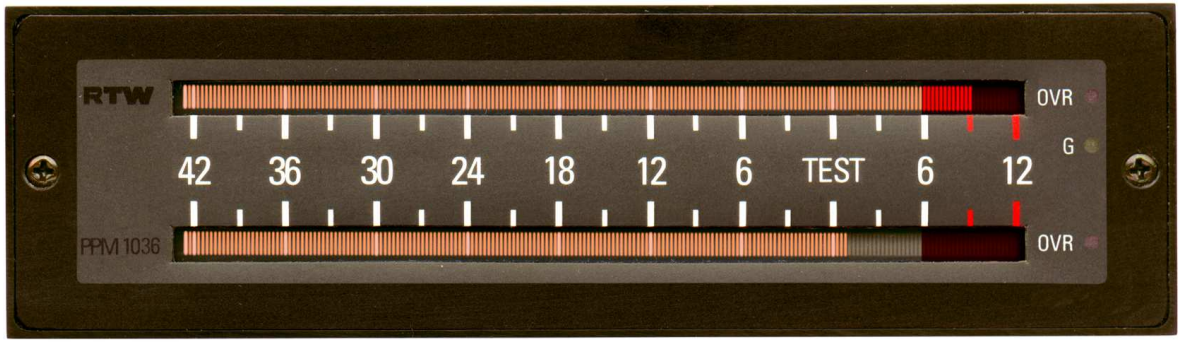
- Display type : Quasi-Peak
- Integration time : 20 msec
- Release time 7 to 1: 2.8 sec
- Display range: 1 to 7 (British IIa)
- Display range : -12 to +12 (British IIb)



Differences in Standards– 2 -

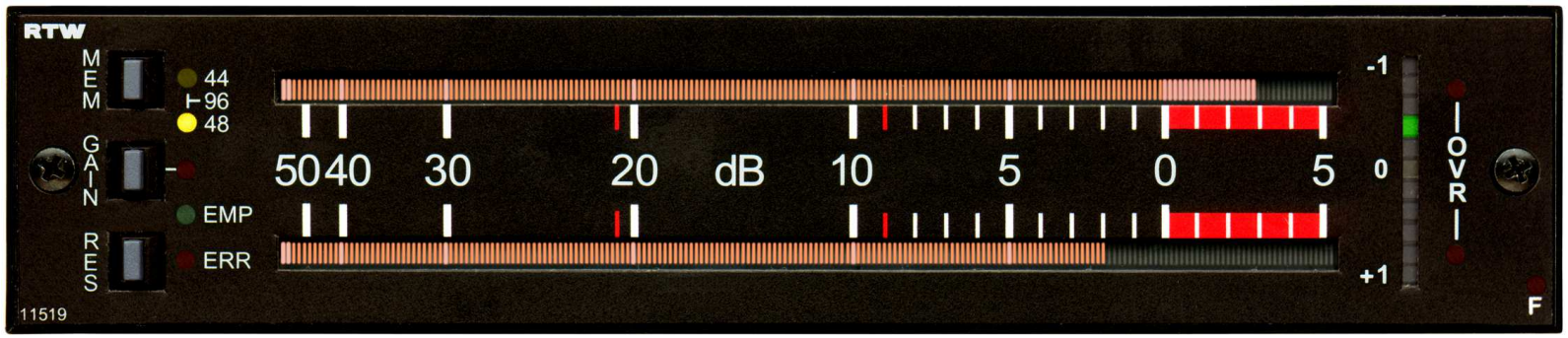
- **Nordic**

- Display type : Quasi-Peak
- Integration time : 5 msec
- Release time to -20dB: 1,7 sec
- Display range : -42 to +12 dB



- **DIN**

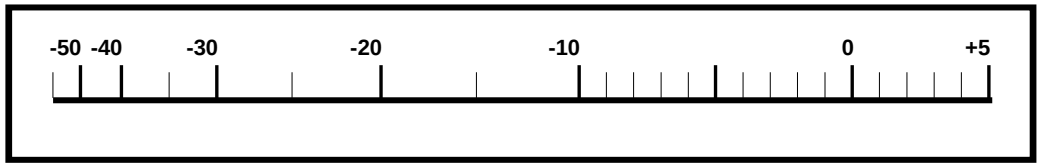
- Display type : Quasi-Peak
- Integration time : 10 msec
- Release time to-20dB: 1,5 sec
- Display range : -50 to +5(10) dB



RTW

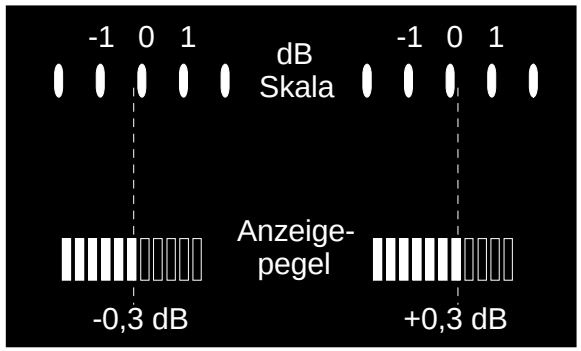
Extract from (German Standard) Pflichtenheft 3/6

- **Input sensitivity for display 0 dB: + 6 dBu**
- **Measuring range related to +6 dBu: -50 dB bis +5 dB**
- **Scale:**

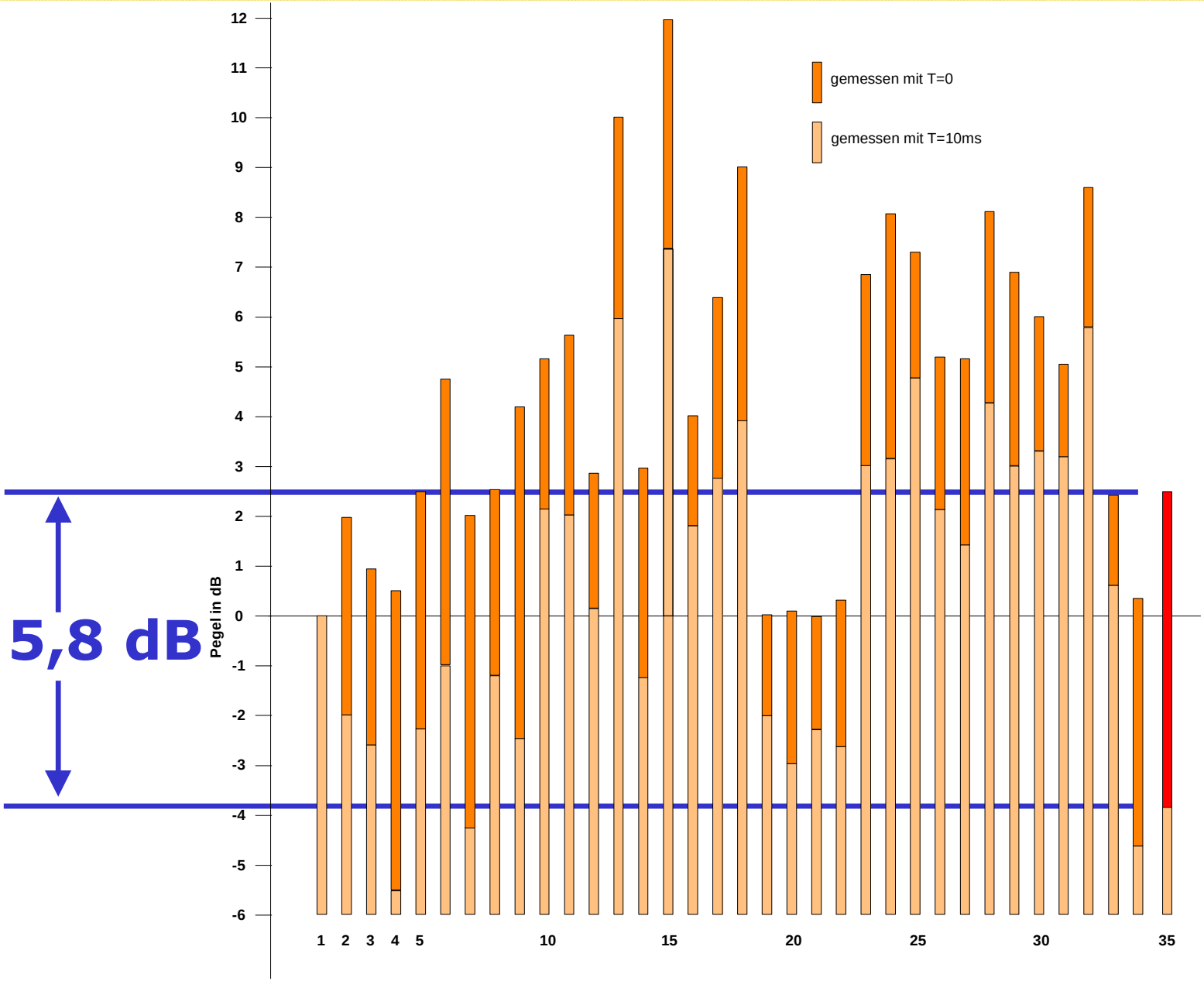


- **dB linear in a range from -10 dB to +5 dB**
- **-9 dB has to be marked colored**
- **Infinity segment should be lit all time**

- **In the -10 dB to +5 dB area a segment should only be lit after exceeding the level marked**
- **Frequency range 30 Hz to 20 kHz (>20 kHz slope >12dB/octave)**

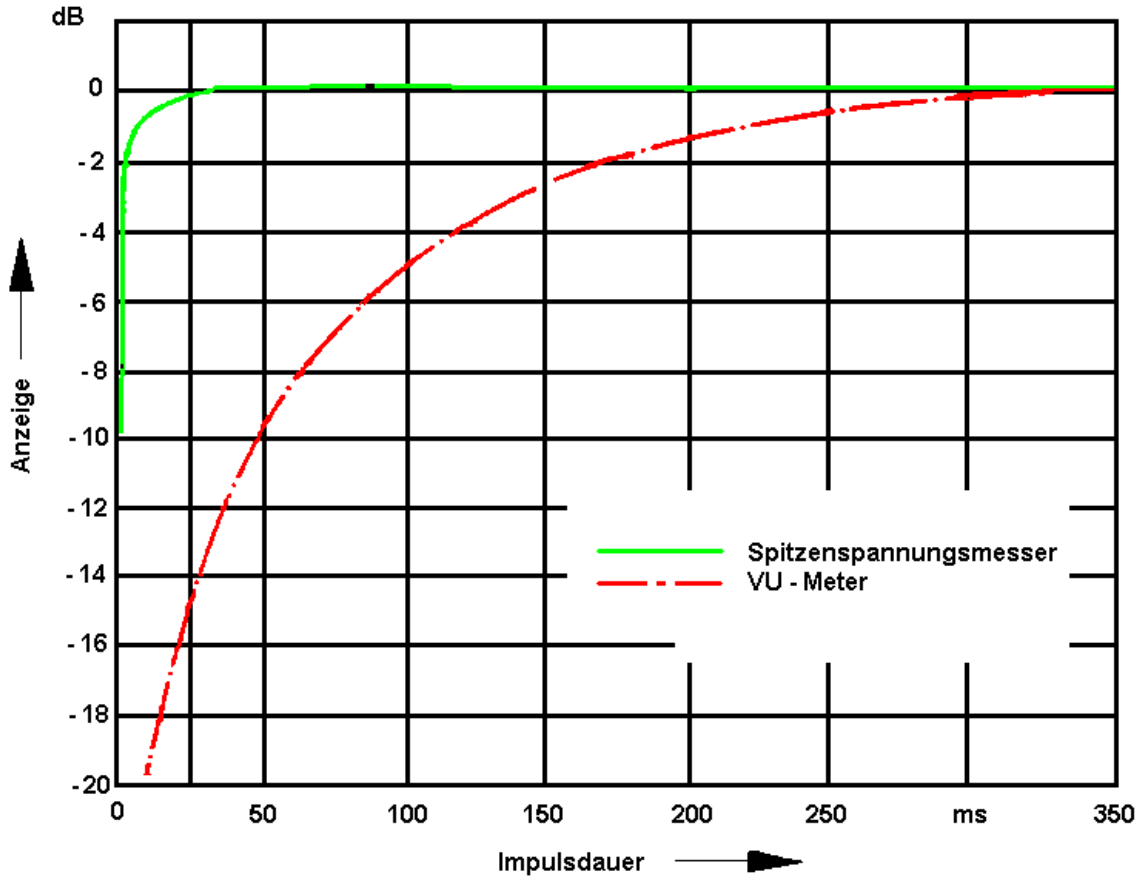


Level difference @ 10 msec or sample



- 1 Sine wave
- 2 Cabassa
- 3 Claves, wood
- 4 Claves, ceramic
- 5 Tambourin
- 6 Maracas
- 7 Triangle I
- 8 Triangle II
- 9 Bibroslop
- 10 Congas I
- 11 Congas II
- 12 Congas III
- 13 Cymbals I
- 14 Cymbals II
- 15 HH
- 16 Speech, female I
- 17 Speech, female II
- 18 Speech, male I
- 19-22 Piano
- 23 Jazz
- 24 Dance music
- 25 Speech, male II
- 26 Orchestra,, Prokofjew
- 27 Orchestra, Glinka
- 28 Applause
- 29 Orchestra, Hindemith
- 30 Orchestra, Moussorki
- 31 Orchestera, Bernstein
- 32 Cembalo
- 33 Piano V
- 34 Noise from keys
- 35 Speech, extremly near by microphone capsule

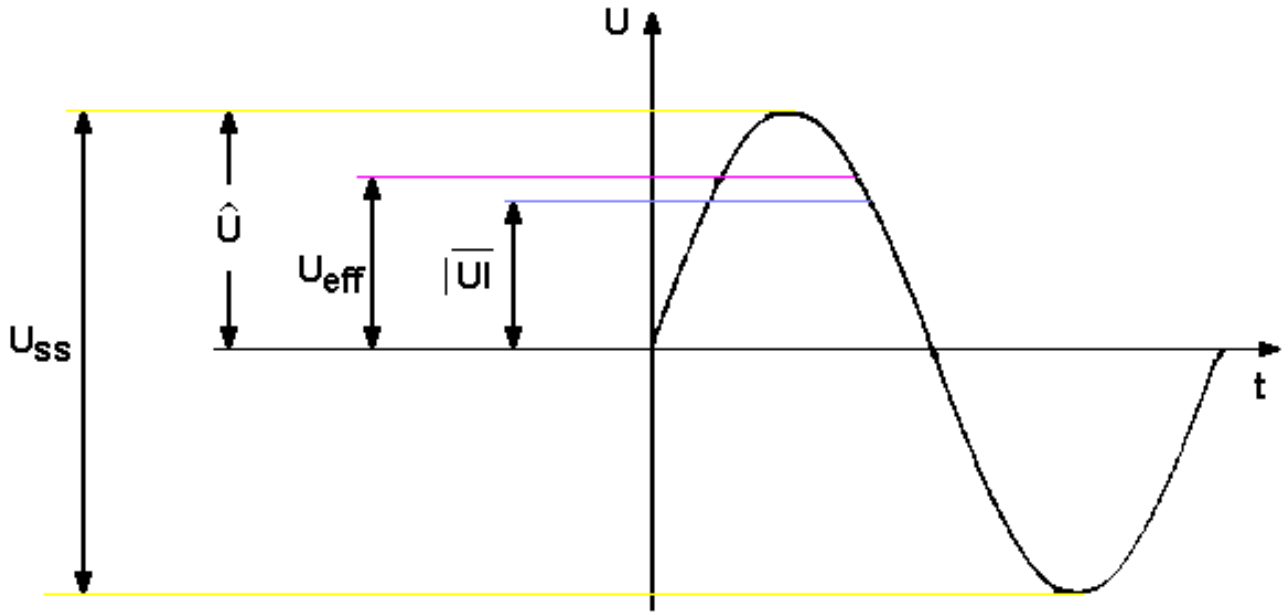
VU versus QPk



Level readings of Peakmeter and RMS-Meter (VU-Meter) in relation to the duration of the audible impulse time

Quelle KinotechnikNr 11/1963

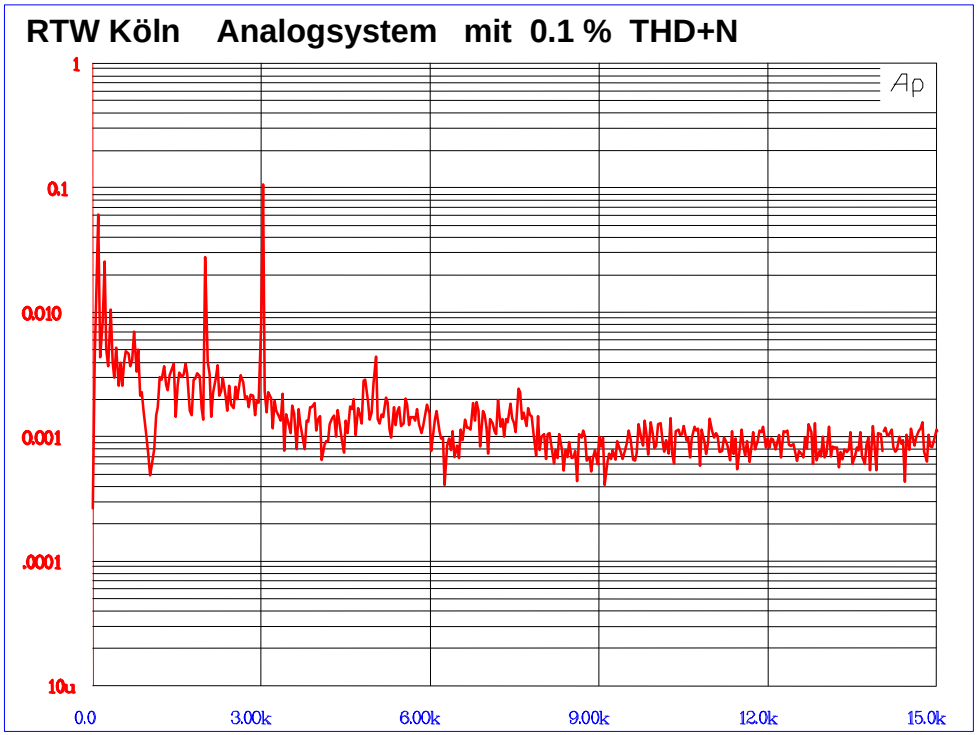
Formula



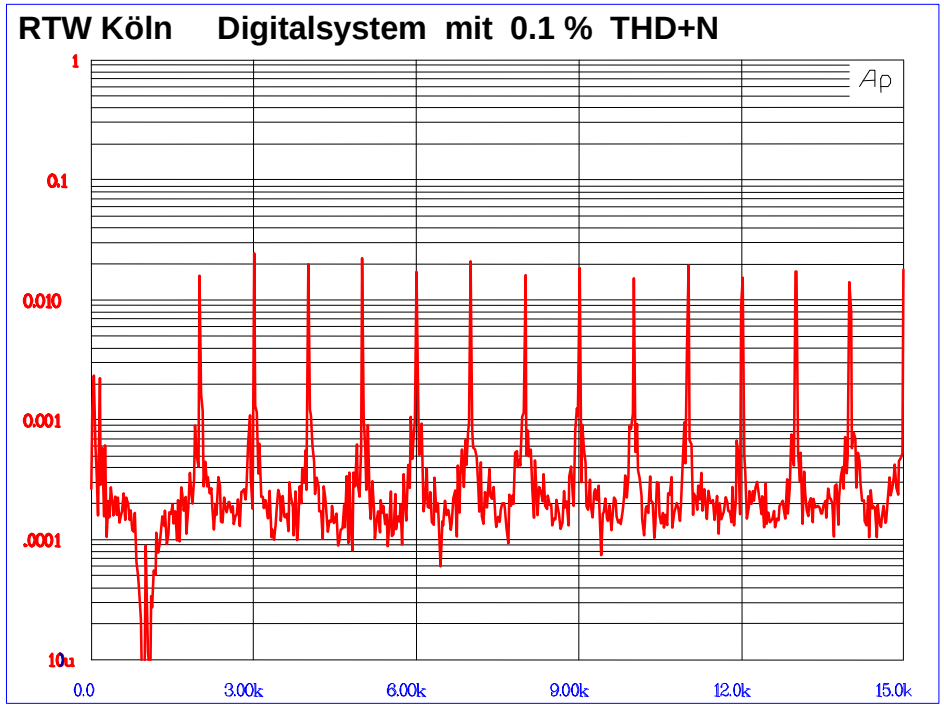
Relative value of Pk,Pk-Pk, RMS and absolute average reading of a sine wave signal

- **RMS = (1/√2) * Peak**
- **Crest-Factor = Peak/RMS i.e. with sine wave signals √2 = 3 dB**
- **Quasi-Peak = Peak -3 dB**
- **Sine: Quasi-Peak and RMS-reading are identical**

Distortion spectrum

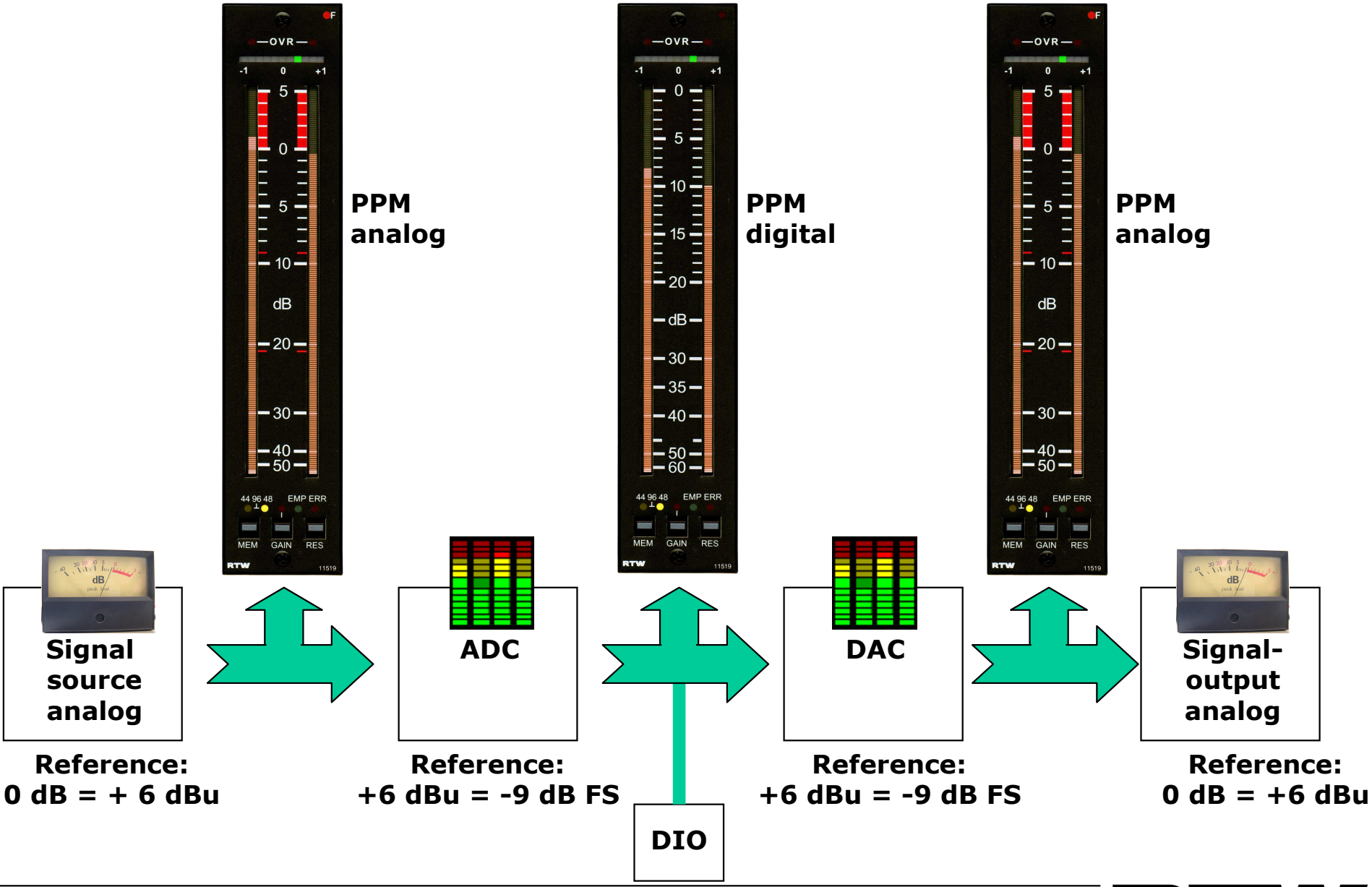


- **Typical analog distortion spectrum reaching overload level**

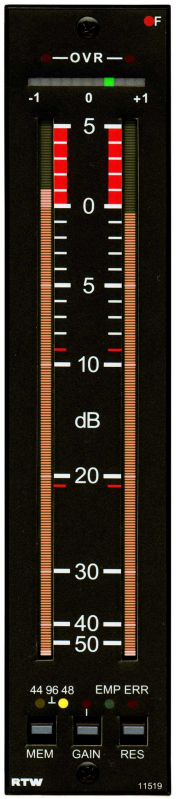


- **Typical digital distortion spectrum reaching overload level**

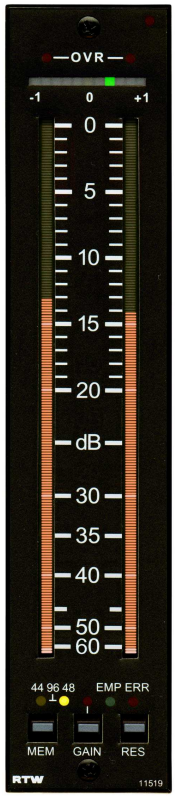
Example of application



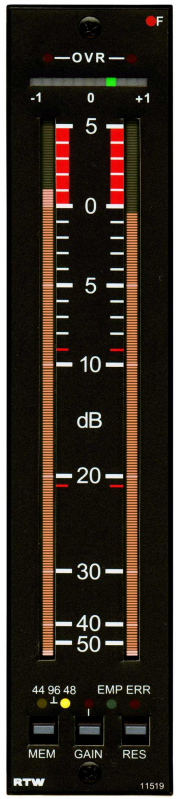
Example of application



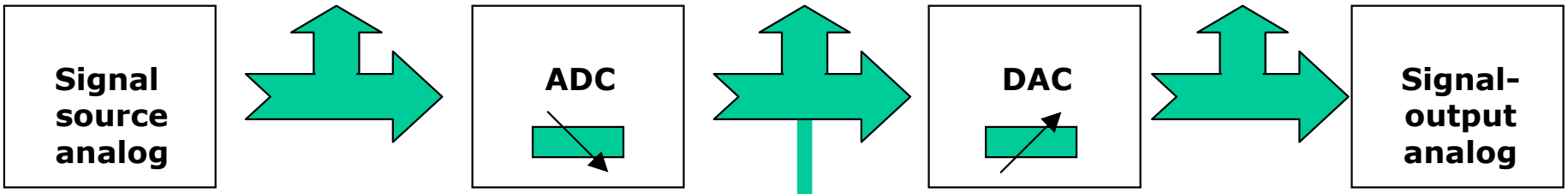
PPM analog



PPM digital



PPM analog



Reference:
0 dB = + 6 dBu

Reference:
+16 dBu = –9 dB FS
(-5 dB)

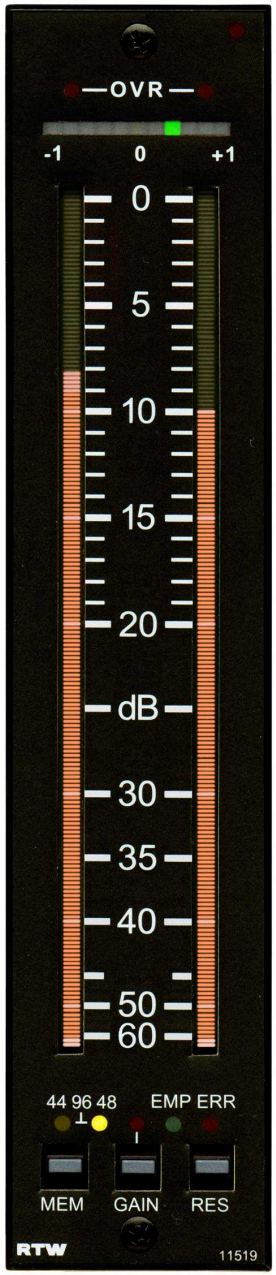
Reference:
+16 dBu = –9 dB FS
(+5 dB)

Reference:
0 dB = +6 dBu

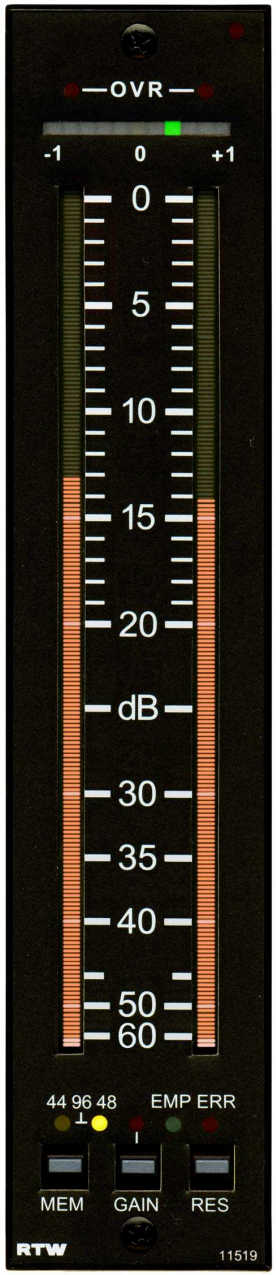
RTW

What do you like, stranger ?

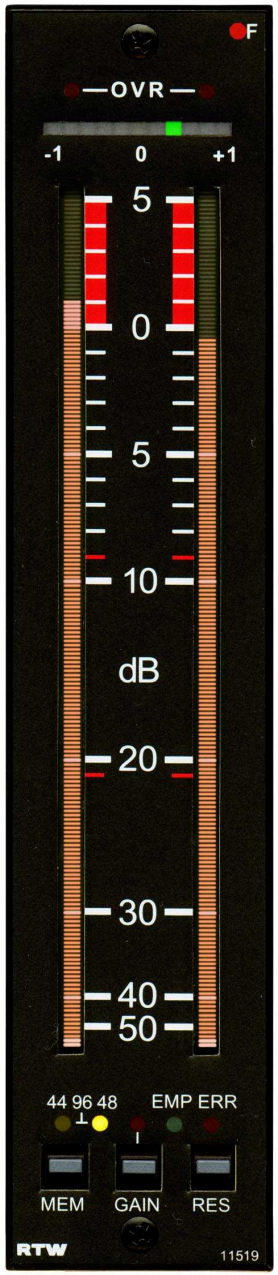
What are you measuring ?



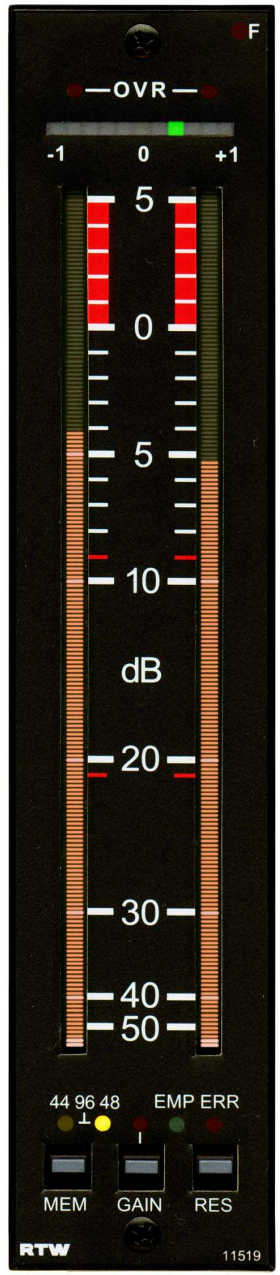
T = 0ms



T = 10ms



T = 0ms



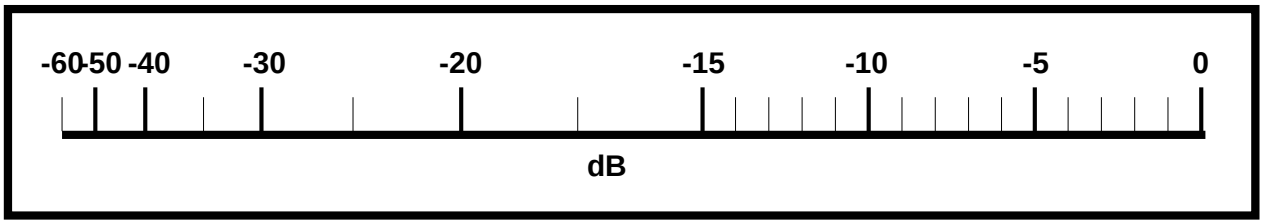
T = 10ms

Considerations for digital Metering

- 1. Integration time
- 2. Headroom range
- 3. Overload-Bit
- 4. Weighting depth
- 5. Count of oversamples..
- 6. Scale
- 7. DC or HP-filter
- 8. Gain +20 dB or + 40 dB
- 9. Bandwidth

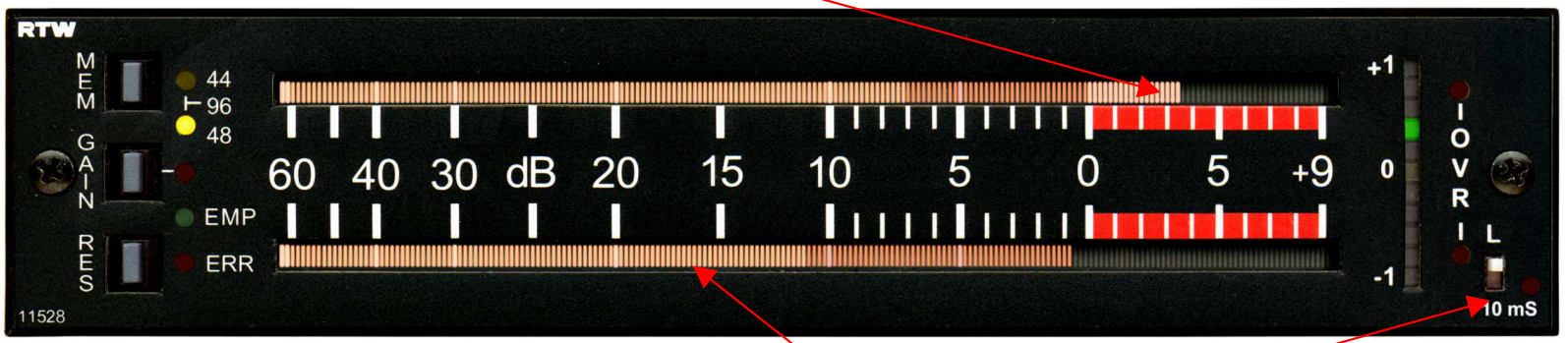
German Standards (Pflichtenheft 3/6) for digital PPM

- **Input sensitivity for display 0 dB:** **0 dBFS**
- **Measuring range:** **-60 dB bis 0 dB**
- **Gain:** **+40 dB**
- **Bandwidth:** **0 Hz(DC) - 95% 1/2FS**
- **Overload with adjustable word width:** **(16 Bit)**
- **Overload with adjustable sample count:** **(3)**
- **Integration time:** **(Sample)**
- **Headroom:** **-9 dBFS**
- **Scale**



The BR-Idea

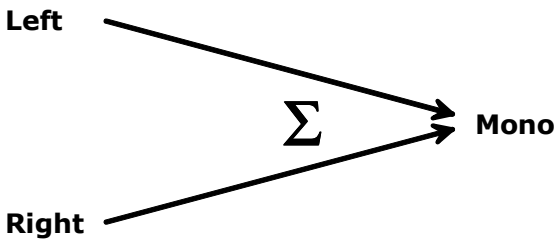
- **Scale -60 to + 9 (dBFS)**
- **Integration time „sample“**

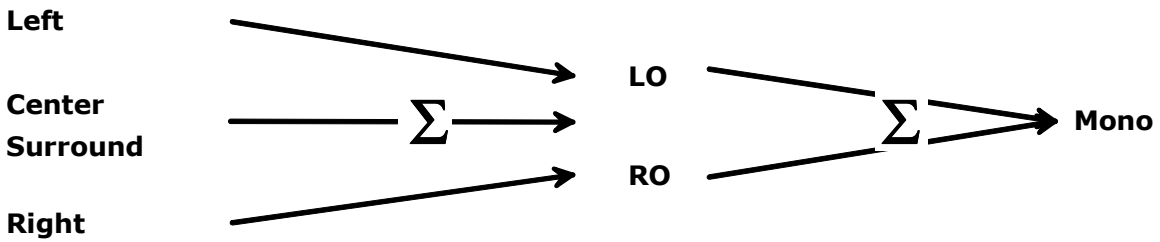


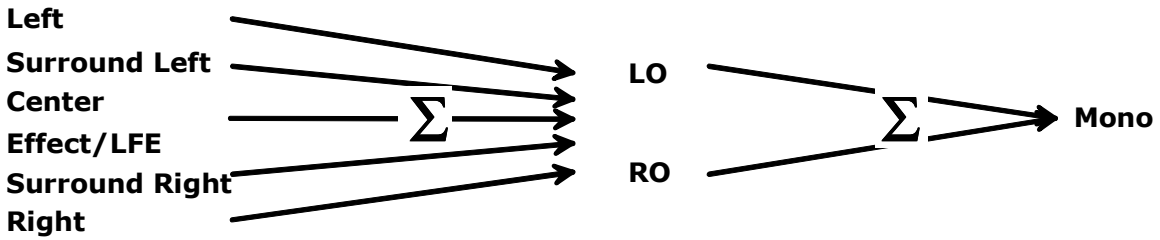
- **selectable additional 10 msec integrated level display or loudness display**

Correlation

Signal compatibility

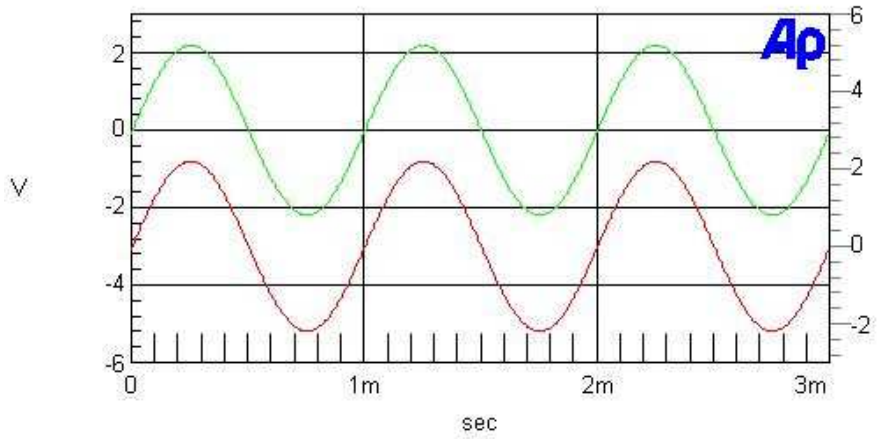




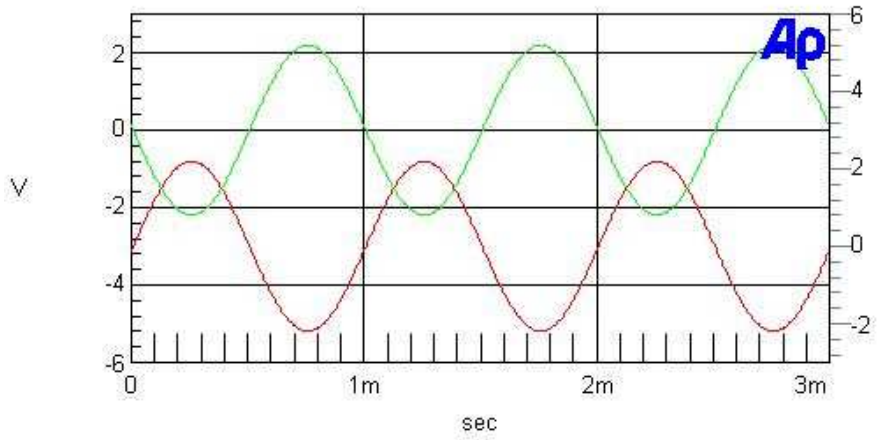


Correlation- What does it mean ?

Correlation is the phase relation between two channels or the statistical relation of two signals

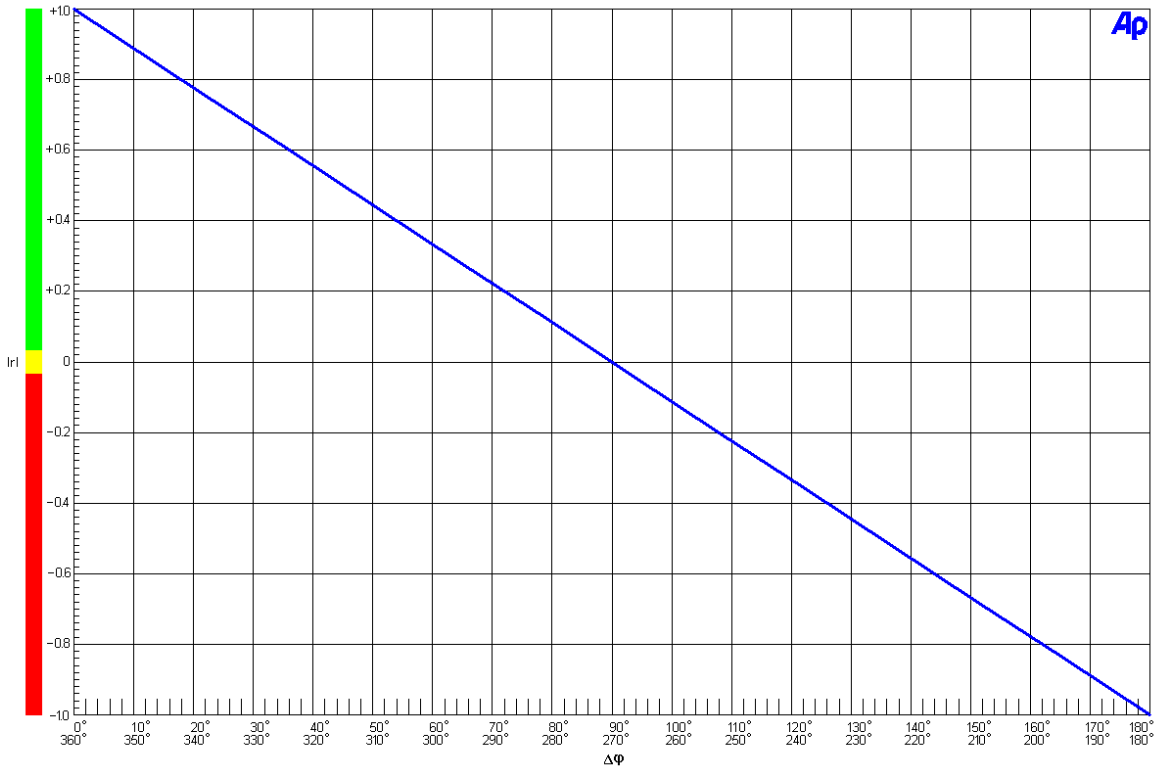


$\sum$ **+ 6 dB**



$\sum$ **- ∝ dB**

Correlation values



Relation of correlation to differential phase

Correlation r	Phenomenon
0	no input signal for both channels
0	input signal for one channel only
,0	noncoherent signal at both channel
+ 1	"in-phase" signal at both channels
- 1	"out-of-phase" signal at both channels

Functional principal of RTW correlator