ASSOCIATION of PROFESSIONAL
WIRELESS PRODUCTION TECHNOLOGIES e.V.

PMSE and WSD

Dré Klaassen
President APWPT
March 20, 2012

APWPT
ASSOCIATION of PROFESSIONAL
WIRELESS PRODUCTION TECHNOLOGIES e.V.

PMSE and WSD

- Characteristics of radio microphones.
- Frequencies used.
- Applications.
- Economic spin off examples.
- Intermodulation.
- WSD in UHF TV band.

APWPT
ASSOCIATION of PROFESSIONAL
WIRELESS PRODUCTION TECHNOLOGIES e.V.

Characteristics of radio microphones

- Very high audio quality.
  - No latency above 4 ms in total audio chain
  - Very high dynamic range (up to 117 dB A weighted)
- 100% duty cycle.
- Identical requirements for analogue and digital microphones.
- Digital microphones will require more bandwidth to meet the audio quality of hi-end analogue systems.

Frequencies used (UK model)

- Currently TV channels 21-69 on an individual licence arranged by JFMG.
  - date/time/place coordinated frequencies with sole user rights.
  - TV channel 69 nation wide available on a shared license basis.
  - TV channel 38, 39 and 40 till January 1 2012 regionally available on a shared license basis.
- After 2012 only TV channels 21 till 30 and 39 till 60 on individual license arranged by JFMG.
  - date/time/place coordinated frequencies with the sole user rights.
  - TV channel 38 from January 1 2012 on shared license basis.

APWPT
ASSOCIATION of PROFESSIONAL
WIRELESS PRODUCTION TECHNOLOGIES e.V.

Applications

- Concerts/bands.

- Houses of worship.
- Press conferences/elections.
- Musical industry/theatres/concert halls.
- Exhibition and conference centres etc.
- Major sport events (OG, Tour de France, Wimbledon, F1: every week at least 1 or 2 major events in UK only, needing almost all UHF TV band interleaved spectrum).

APWPT
ASSOCIATION of PROFESSIONAL
WIRELESS PRODUCTION TECHNOLOGIES e.V.

Economic spin off examples

- Eurovision song contest generates £180mln on SMS revenues in 1,5 hour EU wide.
- X factor, the Voice, all generate SMS revenues.
- London West End generates an estimated £500mln annually on tourist markets revenues only.
- OG creates spin off on infrastructure, tourism, VAT, and social value.

APWPT
ASSOCIATION of PROFESSIONAL
WIRELESS PRODUCTION TECHNOLOGIES e.V.

Intermodulation

- IM products occur when 2 TX are in close proximity of each other.
    - 2fTx1 –fTx2=IM 1; 2fTx2-fTx1=IM2.
    - Number of IM products= nRM^2-nRM (e.g. 20 radio microphones = 400-20=380 IM frequencies.
    - Because of IM frequencies a multichannel RM system needs a calculated frequency plan and adjusted bandwidth.
- In data transmission IM interference occur as slow data transmission/congestion and drop outs.
- In radio microphones IM products occur as harmful interference (audible).

APWPT
ASSOCIATION of PROFESSIONAL
WIRELESS PRODUCTION TECHNOLOGIES e.V.

WSD in UHF TV band

Scenario description

- WSD (e.g. future 3GPP/4GPP)may be body worn and therefore mobile/nomadic.
- During an event every individual in the venue may have a mobile WSD.
- Audiences in the above applications may vary between 100 till 100.000 individuals (theatre, football stadium...).
- In potency 100 till 100.000 of potential interferers and IM's to the RM system may be present in the venue.

APWPT
ASSOCIATION of PROFESSIONAL
WIRELESS PRODUCTION TECHNOLOGIES e.V.

WSD in UHF TV band

Scenario description

- PMSE multichannel system in TV channels 43 and 44
- WSD in adjacent channels below and above PMSE multichannel system
- Inside the venue most of WSD IM products fall exactly inside 43 and 44

APWPT
ASSOCIATION of PROFESSIONAL
WIRELESS PRODUCTION TECHNOLOGIES e.V.

WSD in UHF TV band

- Protection criteria
  - Protection ratio's of RM receivers should be met.
  - Sensing should be developed to meet lower thresholds to protect PMSE.
  - BBC/ETSI TG17 WG3 conducted measurements on receivers to generate input to ECC SE 43.
  - Beacon systems for RM should be studied.
  - Databases must contain any information on RM usage and locations of major events.

APWPT
ASSOCIATION of PROFESSIONAL
WIRELESS PRODUCTION TECHNOLOGIES e.V.

WSD in UHF TV band

- Unwanted software.
  - WSD manufacturers have to do the best to overcome abuse of software.
  - Regulators have to guarantee the highest priority to major events and sufficient protection criteria for the daily use of RM.
  - It is unacceptable WSD may use co channel frequencies with assigned RM spectrum.
- Aggregated power.
  - Studies have to be undertaken by relevant standardisation and regulatory bodies.
- IM products created by WSD.
  - IM products created by WSD in adjacent bands may cause in band IM and cause harmful interference (please consider the above IM scenario).

APWPT
ASSOCIATION of PROFESSIONAL
WIRELESS PRODUCTION TECHNOLOGIES e.V.

WSD in UHF TV band

Fundamental APWPT position:

- Full protection of PMSE against new technologies and WSD.

Through:

- Protection criteria to guarantee an interference free production.
- That transmitted radiated power (in- and out of the PMSE band) is significantly lower than currently discussed.
- Before introducing WSD on a wider scale the technology should be tested in a dedicated band to prove coexistence with incumbent users (e.g. TV channel 60: 782 till 790MHz).

APWPT
ASSOCIATION of PROFESSIONAL
WIRELESS PRODUCTION TECHNOLOGIES e.V.

WSD in UHF TV band

- Responsibilities.
  - Manufacturers of WSD should be liable for any disruption to major events .
  - WSD manufacturers and users should be liable for any financial claims resulting from disruption of major events .
- The database
    - RM users should be able to register their frequency and location in the database with the least administrative burdens and costs.
    - WSD manufacturers have to guarantee the WSD will always obey the database by complying to the relevant ETSI standard.
    - Regulators need to take all the necessary measures to ensure an interference free environment for PMSE.

APWPT
ASSOCIATION of PROFESSIONAL
WIRELESS PRODUCTION TECHNOLOGIES e.V.

WSD in UHF TV band

- Remaining issues?