LIST OF AREAS REQUIRING FURTHER STUDIES

(from Chapter 11 of ECC Report 159)

A	**Areas related to WSD characteristics**
A1	Well-established technical characteristics of WSDs (including their classification) are necessary in order to confirm the analysis and conclusions made in the report. This would require information on the technology for WSDs from manufacturers and standardization bodies (e.g. IEEE and ETSI). In particular, it should be verified that the assumption made in relation to the WSD technology (OFDM) is appropriate in order to use the protection ratios for DTT subject to LTE interference, based on the ECC Report 148. There may also be a need to extend the knowledge on protection ratios to DTT receivers not covered in ECC Report 148.
A2	Feasibility of a reliable autonomous operation of WSDs using sensing should be further addressed taking into account the possibilities offered by collaborative sensing techniques and experience that may be gained from sensing field test.
A3	Further study is needed to investigate the possible specification of the minimum required adjacent channel leakage ratio for the WSDs for use by geo-location databases
B	**Technical considerations on the protection of the broadcasting service**
B1	Identification of a common set of the parameters defined in the methodology described in § 4.3.2 and recalled in Annex 10 (§ A.10.4) to calculate location specific WSD power levels is required.
B2	The possibility to set up fixed maximum permitted e.i.r.p. limits for WSDs taking into account indications from the industry on the foreseen operational ranges of WSDs and their possible classification.
B3	Additionally, if future technological developments show that the autonomous operation of WSD is reliable, then a method to determine the maximum WSD e.i.r.p. limits (under the constraint of having to avoid harmful interference to primary receivers) based on sensing results may be studied.
C	**Technical considerations on the protection of PMSE**
C1	The protection ratio and overloading levels for PMSE technology should be confirmed by a measurement campaign considering the interference from LTE (or other candidate WSD technology) into existing analogue and digital PMSE receivers.
C2	Further work is required on the PMSE application scenarios that should be considered for sensing studies. The model developed so far, based on a single sensing threshold with flat fading, is too simplistic. Appropriate channel models describing the fading characteristics on the detection path should be developed to understand characteristics of the signal available for sensing.
C3	Data on digital PMSE systems is required to understand the sensing requirements (by WSDs) of more recent PMSE equipment.
C4	Viability of the beacons as well as usability of sensing in addition to the geo-location database to achieve protection of PMSE services should be further considered.
D	**Regulatory consideration on the protection of PMSE**

D1	The approaches to protect PMSE services from WSD interference need to be identified in accordance with the regulatory regimes employed by different administrations. Specifically, there is a need for further investigation related to the development of a "package solution" that covers a number of tools from which individual countries can choose, such as registration of PMSE in the database and safe-harbour solution.

E	**Protection of aeronautical radionavigation (ARNS) in the 645-790 MHz band**
E1	Clarification on ARNS deployment scenarios would be required in order to conduct appropriate studies.

F	**Protection of services in the bands adjacent to 470-790 MHz**
F1	There is a need for further studies on the impact from WSD on services in the bands adjacent to the 470-790 MHz band, e.g. on mobile service below 470 MHz and above 790 MHz (see also section 8.1.6).

G	**Specification and implementation of the requirements for the geo-location database approach**
G1	The regulatory requirement for the communication protocol/interface between the geo-location database and WSDs should be thoroughly specified covering different situation that might be encountered in practice.
G2	The master/slave concept needs to be developed further, e.g. with respect to information to be provided by the geo-location database and to any interference aggregation within the entire area of expected operation of the master WSD.
G3	Alternative methods to specify the local-specific output power level of WSDs may need to be developed that would address the potential aggregate interference from various WSD transmitters taking into account the number of active WSDs and satisfying the requirements of both incumbent service protection and obtaining maximized output power of WSDs.
G4	The approach combining the geo-location database and spectrum sensing needs to be further elaborated.
G5	Consideration should be made on the possible allowance for devices reporting that they would use less than the maximum allowed power in the channel in question.
G6	Further work might be needed on accurate position determination if a WSD is to be operated indoor or at a certain height above ground, e.g. on a certain floor inside a building.
G7	Consideration should be given by standardisation bodies to the application of the geo-location translation methodology developed in this Report in order to derive maximum e.i.r.p. values for WSDs for protection of broadcast networks across Europe. This will provide useful guidance for the development of proposals for WSD technology.

H	**Assessment of the consequential spectrum potentially available for WSD**

H1	Amount and utility (e.g. possible capacity and data rates) of white space and their dependency on the relevant parameters have to be examined more thoroughly (e.g. cross-border effects) and sensitivity analysis with regard to protection requirements needs to be conducted. The examination should include consideration of interference stemming from incumbent services into WSDs.

Identified by WG SE for immediate studies within SE43

Identified by WG SE for further studies within SE43

To be dealt with outside WG SE