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Mobile phones' electromagnetic fields and occupational cancer, between Directive 2013/35/EU and Italian Supreme Court case law

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Davide Casale

Mobile phones' electromagnetic fields and occupational cancer, between Directive 2013/35/EU and Italian Supreme Court case law

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Abstract
La diffusione delle tecnologie di comunicazione senza fili solleva delicate questioni giuslavoristiche. La Direttiva 2013/35/EU, sulla protezione dei lavoratori rispetto all'esposizione ai campi elettromagnetici, esclude esplicitamente dal suo campo d'applicazione la prevenzione di possibili effetti cancerogeni a lungo termine, in quanto non esiste attualmente alcuna evidenza scientifica che comprovi in maniera conclusiva un nesso di causalità. La Corte di Cassazione italiana, viceversa, ha recentemente riconosciuto (ai fini della copertura previdenziale da parte dell'Inail) il nesso di causalità tra un tumore all'orecchio interno di un lavoratore e la prolungata esposizione alle onde elettromagnetiche emesse dai telefoni cellulari. Tale sentenza solleva interrogativi sull'affidabilità, rispetto al principio di precauzione, dell'approccio adottato in proposito dalla menzionata Direttiva prevenzionistica. Si tratta, inoltre, di un precedente giurisprudenziale importante, sia per le sue potenziali implicazioni pratiche, sia per quanto riguarda i criteri con cui la conoscenza scientifica assume rilevanza in giudizio.

The widespread adoption of wireless communication systems may raise delicate labour law issues. Directive 2013/35/EU, on the protection of workers against exposure to electromagnetic fields, explicitly excludes from its scope the prevention of possible long-term carcinogenic effects, because there is currently no conclusive scientific evidence establishing a causal relationship. However, the Italian Supreme Court has recently recognized causation (for social security purposes) between a worker's cancer and his prolonged exposure to electromagnetic fields of mobile phones. Such decision prompts to question the reliability of the precautionary approach adopted in the above Directive. Moreover it is an important precedent for its potential practical implications, as well as with regard to the criteria by which scientific knowledge becomes relevant in legal proceedings.

Parole chiave: malattie professionali, causalità, Inail, campi elettromagnetici, prova statistica, principio di precauzione
Keywords: occupational diseases, causation, social security, electromagnetic fields, statistical evidence, precautionary principle

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by Davide Casale

25/2013

SUMMARY: 1. Directive 2013/35/EU on the protection of workers from electromagnetic fields. – 2. (Continued) Scientific uncertainty and precautionary principle. – 3. An innovative ruling of the Italian Supreme Court on the causal link with cancer. – 4. Scientific progress and open legal system for the recognition of occupational diseases. – 5. The statistical-epidemiological criterion in Italian social security law. – 6. (Continued) Concurrence of extra-occupational circumstances of exposure to electromagnetic fields.

1. *Directive 2013/35/EU on the protection of workers from electromagnetic fields*

While the European institutions have been hesitant on the definitive entry into force of preventive rules in occupational risks arising from electromagnetic fields, the Labour Section of the Italian Supreme Court [1] has overtaken European law, recognizing the carcinogenic effects of prolonged exposure to electromagnetic waves emitted by mobile phones.

The deadline for the transposition of Directive 2004/40/EC [2], on the minimum health and safety requirements regarding the exposure of workers to the risks arising

[1] Cass. no. 17438 of 12 October 2012, in *Rivista italiana di diritto del lavoro*, 2013, II, p. 752, with a comment by A. ROTA, *Sulla natura professionale del tumore contratto per* overuse *del cellulare in ambito lavorativo*.

[2] As regards the Italian legal system, see Articles 206-212, of Legislative Decree no. 81 of 2008, which regulate the protection of workers from risks associated with the exposure to electromagnetic fields, on which see M. MARINI, *Gli agenti fisici*, in L. ZOPPOLI, P. PASCUCCI, G. NATULLO (edited by), *Le nuove regole per la salute e la sicurezza dei lavoratori: commentario al D.Lgs. 9 aprile 2008, no. 81, aggiornato al D.Lgs. 3 agosto 2009, no. 106*, Milan, Ipsoa, 2010, pp. 734-738; G. FALCIASECCA and M. BARBIROLI, sub *Artt. 206-212*, in P. TULLINI (edited by), *Gestione della prevenzione*, vol. II of L. MONTUSCHI (directed by), *La nuova sicurezza sul lavoro. Commento al d.lgs. 9 aprile 2008, n. 81 e successive modifiche*, Bologna, Zanichelli, 2011, p. 298 ff.; A. MERLINO, *Valutazione del rischio da esposizione a campi elettromagnetici*, in *Igiene e sicurezza sul lavoro*, 2011, p. 771; A. CONIGLIO

from electromagnetic fields, was recently postponed to 31 October 2013 by Directive 2012/11/EU (the original implementation deadline had been previously postponed from 30 April 2008 to 30 April 2012 by Directive 2008/46/EC). However, the 2004 Directive will indeed never enter into force. In fact, in 2011 the European Commission proposed to repeal it through a new Directive that should replace it [3]. The proposal for the new Directive, amended by the European Council in autumn 2012 [4] and by the Parliament in June 2013, was subsequently approved as Directive 2013/35/EU [5].

This is the 20th individual Directive within the meaning of Article 16(1) of Directive 89/391/EEC. The initiative of the European institutions was prompted by the criticism against Directive 2004/40/EC raised by some sectors of industry, especially military forces and automotive industries [6], as well as from some health sector professions. In particular, the medical community working with magnetic resonance imaging (MRI, important diagnostic systems in the treatment of many diseases) claimed it would be hampered by the strict exposure limit values laid down in such Directive [7]. Taking into account such criticism, the new Directive contemplates different scenarios and amends the relevant technical thresholds.

Directive 2013/35/EU also contemplates further clarifications in revised and new definitions. For purpose of identifying its scope, the Directive contemplates the definition of «electromagnetic fields» (whose frequencies are up to 300 GHz) and takes into account the effects caused by electromagnetic fields, both directly [8] and indirectly (i.e. caused by the presence of an object in an electromagnetic field that may become the cause of a risk for a worker) [9]. While defining «exposure limit values»

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and L. BEGNOZZI, *Protezione, qualità e sicurezza per gli operatori in risonanza magnetica*, in *Igiene e sicurezza sul lavoro*, 2012, p. 4.

[3] Document COM(2011) 348 final, of 14 June 2011. Also see the working document of the services of the Commission's Impact Assessment summary, SEC(2011) 751 final, accompanying the proposal for the relevant Directive.

[4] Document 14020/12, SOC 764, CODEC 2184, of 27 September 2012, under interinstitutional file 2011/0152 (COD).

[5] *Official Journal of the EU*, L 179, 29 June 2013, p. 1. The Directive shall be transposed in the Member States by no later than 1 July 2016.

[6] Levels of exposure can be high, in particular, for people working with radars or welders and for workers repairing power lines.

[7] The medical community also claimed that restrictions on MRI could lead to increased use of diagnostic procedures using ionising radiation, which would in turn also have an unintended adverse effect on the protection of workers.

[8] The direct effects on the human body, outlined in the proposal for the Directive, are of three types : i) thermal effects, such as tissue heating through energy absorption from electromagnetic fields in the tissue; ii) non-thermal effects, such as the stimulation of muscles, nerves or sensory organs; moreover, the stimulation of sensory organs may lead to transient symptoms such as vertigo and phoshenes, which might create temporary annoyance or affect cognition or other brain or muscle functions and may thereby affect the ability of a worker to work safely; iii) limb currents.

[9] The Directive identifies the following indirect effects: i) interference with medical electronic equipment and devices (including cardiac pacemakers and other implanted or body worn devices; ii) the projectile risk from ferromagnetic objects in static magnetic fields; iii) the initiation of

(ELVs) and «action levels» (ALs), the new Directive also contemplates specific guidelines on employers' obligations for preventive assessment and elimination or minimizing risks arising from electromagnetic fields. Health surveillance is regulated. In this respect non-binding practical guides shall be made available by the Commission. Information and training of employees is also required, as well as the involvement of their representatives in the relevant decision-making process.

With regard to the specificities of the different sectors, Directive 2013/35/EU states that exposure limit values may be exceeded if related to MRI-equipment in the health sector or to related research. Moreover, a general exclusion has been established from this preventive guideline for military applications, except that in any case exposure must be minimized and provided that «adverse health effects and safety risks are prevented». The new Directive also allows Member States to exclude the mandatory compliance with the prescribed quantitative limits in other «specific sectors or for specific activities», provided «duly justified circumstances» exist [10].

2. *(Continued) Scientific uncertainty and precautionary principle*

Despite concerns of the European Parliament set out in its resolution of 2 April 2009 [11], Directive 2013/35/EU «does not cover suggested long-term effects» (Article 1; this is consistent with the terms of Directive 2004/40/EC, which is repealed). In particular, the new Directive expressly excludes from its scope the «possible carcinogenic effects, of exposure to time-varying electric, magnetic and electromagnetic fields», because «there is currently no conclusive scientific evidence establishing a causal relationship» (as stated in the 6th recital of the Directive).

This appears not to take into account the view of the European Economic and Social Committee, which acknowledged the usefulness of a regulatory initiative in this regard, in the light of the precautionary principle stated in the Treaty on the

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electro-explosive devices (detonators); iv) fires and explosions resulting from the ignition of flammable materials by sparks caused by induced fields, contact currents or spark discharges and v) contact currents.

[10] As specified in the Directive, this shall mean circumstances where the risk assessment carried out has shown that values are exceeded and where, given the state of the art, all technical and/or organizational measures have been applied. However, for these cases an indeed ambiguous rule applies, i.e. that the employer must demonstrate that workers are still protected through comparable, more specific and internationally recognized standards and guidelines.

[11] In particular, see points 14 and subsequent of the European Parliament Resolution of 2 April 2009 on health concerns associated with electromagnetic fields 2008/2211(INI), in *Official Journal of the EU*, C 137E, 27 May 2010, pp. 38-42. For an earlier exhortation to prudence, see Council Recommendation 1999/519/EC. In this respect, many written questions have also been submitted in recent years at the European Parliament, available on the official website *http://ec.europa.eu/health/electromagnetic_fields/docs/written_question_en.pdf*.

functioning of the European Union [12]. In particular, in its opinion of December 2011 [13] on the proposal for the Directive, the Committee noted that serious diseases were included among the risks assumed in the current scientific debate about the medium- to long-term non-thermal physiological effects of low frequency fields [14] and that the International Agency for Research on Cancer (IARC) of the World Health Organization has classified low frequency electromagnetic fields and radio wave electromagnetic fields in category 2b as «possibly carcinogenic to humans» [15], a category used when a causal association is considered credible, but when chance, bias or confounding cannot be ruled out with reasonable confidence [16].

Potentially harmful biological effects of electromagnetic fields exposure level even below the thresholds set by the International Commission on Non-Ionizing Radiation Protection (ICNIRP) are reported in a recent Report submitted to the Council of Europe [17]. This Report, based both on a brief evaluation of numerous scientific results and hearings of the European Environment Agency, scientists,

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[12] Article 191 of the Treaty on the functioning of the European Union states: «Union policy on the environment shall aim at a high level of protection taking into account the diversity of situations in the various regions of the Union. It is based on the precautionary principle and on the principles that preventive action should be taken, that environmental damage should as a priority be rectified at source and that the polluter should pay». Although not concerning the working environment but consumer matters, see also the Communication from the European Commission *On the precautionary principle*, COM(2000) 1 final, of 2 February 2000; see M.E. GONÇLAVES, *The precautionary principle in European law*, in S. RODOTÀ, M. TALLACCHINI (edited by), *Ambito e fonti del biodiritto*, vol. I of S. RODOTÀ and P. ZATTI (directed by), *Trattato di biodiritto*, Milan, Giuffrè, 2010, p. 515 ff. For an Italian framework, see A. ZEI, *Principio di precauzione*, 2008, in *Digesto delle discipline pubblicistiche*, Turin, Utet, t. II, p. 670 ff. With regard to the role of the precautionary principle about health and safety on work in the Italian legislation, see MONTUSCHI, *Dai principi al sistema della sicurezza sul lavoro*, in ZOLI (edited by), *Principi comuni*, vol. I of *La nuova sicurezza sul lavoro. Commento al d.lgs. 9 aprile 2008, n. 81 e successive modifiche*, directed by L. MONTUSCHI, Bologna, Zanichelli, 2011, p. 2 ff.

[13] In *Official Journal of the EU*, C 43, 15 February 2012, pp. 47-50. In this opinion, the Economic and Social Committee supports the Commission's proposal to set threshold values but recommends, in order to make the legislation effective in actual fact, establishing fixed threshold values taking those laid down as a reference on implementing Directive 2004/40/EC by Austria, Czech Republic, Slovakia, Lithuania, Latvia, Estonia and Italy.

[14] The following diseases are mentioned therein: disorders of the neuroendocrine system (hormones, melatonin), neurodegenerative diseases (Parkinson's, Alzheimer's, multiple sclerosis), effects on human and/or animal reproduction and development (risk of miscarriage, malformations) and increased risk of cancer (brain tumors, leukemia in children).

[15] This classification dates back to 2001 with regard to the Extremely low frequency magnetic field (due to the possible risk of childhood leukemia) and 2011 with regard to the RF electromagnetic field, following the Interphone study (possible increased risk of glioma, a malignant type of brain tumor): *www.rfcom.ca/programs/interphone.shtml*. However, one must keep in mind that a large assortment of common everyday substances (such as coffee) falls under the same classification. As a brief reference, see N. L'ABBATE, *Motivazioni e significato della classificazione IARC per la telefonia cellulare*, in *Giorn. italiano di medicina del lavoro ed ergonomia*, 2011, 33:3, suppl., p. 384 ff.

[16] World Health Organization, Fact sheet no. 193/2011, in *www.who.int/mediacentre/factsheets/fs193/en*.

[17] Report entitled *The potential dangers of electromagnetic fields and their effect on the environment*, 6 May 2011, Parliamentary Assembly of the Council of Europe, Committee on the Environment, Agriculture and territorial issues, document 12608, p. 3, in *http://assembly.coe.int*.

non-governmental organizations, associations of citizens, workers and entrepreneurs, suggests the adoption of 'ALARA' type precautionary rules (*As Low As Reasonably Achievable*) [18]. Taking into account that thresholds and dose limits are established also in the light of a 'reasonable risk' level, this principle means making every reasonable effort to maintain exposures as far below the thresholds and the limits as practical, consistent with the purpose for which the activity is undertaken, taking into account the state of technology, the economics of improvements in relation to state of technology, the economics of improvements in relation to benefits to the health and safety, and other social and socioeconomic considerations, and in relation to utilization of the devices in the public interest. This Report adds that the wait for a concordance of all scientific evidence and clinical trials could lead to high health and economic costs, as in the case of asbestos, polychlorobiphenyls and tobacco [19].

On this basis, the Parliamentary Assembly of the Council of Europe adopted Resolution no. 1815 of 27 May 2011 [20], which calls for laws relating to electromagnetic field emissions of all types and frequency, to be defined in accordance with the aforementioned ALARA precautionary principle, based on as little risk as possible. Such Resolution also exhorts applying the precautionary principle with utmost cautiousness, as it concerns an issue affecting human health on a large scale.

The core of the precautionary principle consists in the fact that the absence of evidence is not 'proof of absence'. This principle is not a research method or a scientific rule, but reflects a risk management approach [21]. The adoption of such approach is driven by a political choice [22] that, once reflected in the law, will have legal consequences.

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[18] For a legal framework of the Alara *As Low As Reasonably Achievable* principle, and for an overview of the application of the precautionary principle to electromagnetism in supranational context, see J. ZANDER, *The application of the precautionary principle in practice: comparative dimensions*, Cambridge University press, Cambridge, 2010, p. 33 ff., and F. CASOLARI, *Politiche precauzionali ed esposizione a campi elettromagnetici artificiali: modelli gestionali dell'inquinamento elettromagnetico nel diritto internazionale e comunitario*, in A. BIANCHI and M. GESTRI (edited by), *Il principio di precauzione nel diritto internazionale e comunitario*, Milan, Giuffrè, 2006, 398 ff.

[19] For a wide-range perspective about how damaging and costly the misuse or neglect of the precautionary principle can be, see EUROPEAN ENVIRONMENT AGENCY, *Late lessons from early warnings: science, precaution, innovation*, Luxembourg, 2013, *passim*.

[20] Resolution no. 1815/2011, in *http://assembly.coe.int*.

[21] On this principle, see J.B. WIENER, *The rhetoric of precaution*, in J.B. WIENER, M.D. ROGERS, J.K. HAMMITT, P.H. SAND, *The Reality of Precaution: Comparing Risk Regulation in the United States and Europe*, Earthscan, New York, 2011, p. 4 ff.; C. MUNTHE, *The price of precaution and the ethics of risk*, Springer, London, 2011, p. 20 ff.; J. WOLFF, *What is the value of preventing a fatality*, in T. LEWENS (edited by), *Risk: philosophical perspectives*, Routledge, New York, 2007, p. 54 ff.; C. SUNSTEIN, *Laws of fear. Beyond the precautionary principle*, Cambridge University Press, New York, p. 35 ff.

[22] See B. WYNNE, *Normalising Europe – and the world – through science: risk, uncertainty and precaution*, and S. FUNTOWICZ, *Modelli di scienza e policy in Europa*, both in S. RODOTÀ and M. TALLACCHINI (edited by), *Ambito e fonti del biodiritto*, quoted above, p. 502 ff. and p. 541 ff.; M. TALLACHINI,

Prior to its approval, the European Parliament amended Article 1 of Directive 2013/35/EU. Pursuant to such amendment, the European Commission shall keep under review the latest scientific developments. In particular, if «well-established scientific evidence» on long-term effects becomes available, the Commission shall consider a suitable policy response, including the submission of a legislative proposal to address such effects. Nonetheless, given the terms of the Directive, it may be argued that the precautionary principle does not apply to the long-term effects of electromagnetic fields.

However, this argument would be wrong. The fact that the precautionary principle is set in the European Treaties, i.e. in a source of para-constitutional rank, makes possible judicial control of the exposure thresholds established not only in administrative rules but also in legislation [23], in the light of any scientific knowledge developments.

3. *An innovative ruling of the Italian Supreme Court on the causal link with cancer*

On 12 October 2012, by decision no. 17438, the Italian Supreme Court intervened precisely on the long-term effects of electromagnetic fields, which, as mentioned, are explicitly excluded from the scope of the European legislation on health and safety at work. Concerning a pathology that actually occurred, this court case overtakes precautionary principle issues. Arousing sensation even in the press, the Work Section of the Supreme Court has finally confirmed a decision of the Court of Appeal [24], which had recognized the existence of a causal link between exposure to electromagnetic radiation due to the use of the mobile phone and a cancer of the ear of a worker.

In carrying out tasks assigned to him as an executive, involving international contract transactions, this worker had used mobile and cordless phones about six

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Epistemologie dell'ignoto, politica e diritto, in L. MARINI and L. PALAZZANI (edited by), *Il principio di precauzione tra filosofia, biodiritto e biopolitica*, Rome, Edizioni Studium, 2008, p. 100 ff.

[23] With regard to the limits established by regulations for the implementation of Italian framework law on the protection from exposure to electric, magnetic and electromagnetic fields (law no. 36/2001), the highest Court for administrative matters (Consiglio di Stato, section VI, 12 January 2011, no. 98, in *Foro amministrativo. Consiglio di Stato*, 2011, 201) rejected a doubt of constitutionality, stating that the fact that these exposure limits are not the result of experimental studies but mere forecasts does not concretize the violation of the precautionary principle: the existence of mandatory limits, while there is no conclusive scientific evidence, instead confirms correct application of the principle. For an overview of Italian administrative laws, see C.M. GRILLO and M. FAVAGROSSA, *Profili giuridici in tema di inquinamento elettromagnetico*, in *Rivista giuridica dell'ambiente*, 2012, 3-4, p. 377; A. BORZÌ, *Inquinamento elettromagnetico: spunti sulla disciplina comunitaria e nazionale, tra precauzione e sostenibilità*, in *Ambiente e sviluppo*, 2012, 2, p. 136.

[24] Court of Appeal of Brescia, 22 December 2009, no. 614, in *Guida al diritto*, 2010, no. 11, p. 69, with a comment by M. TATARELLI; and in *Responsabilità civile e previdenza*, 2010, p. 1395, with a comment by E. AL MUREDEN.

hours every day for twelve years. Having been ill with cancer in the inner ear, he had asked an annuity to the Italian social security Institute for the prevention and the insurance of occupational disease (INAIL), which had been denied by administrative decision confirmed by the Labour Court. After it overturned the decision of the Labour Court, the Court of Appeal condemned the social security Institute to pay the occupational disease annuity. Such decision was then confirmed by the Italian Supreme Court (or Supreme Court of Cassation).

The most interesting issue in this dispute emerges from the medical-legal standpoint. The decision of the Supreme Court was based on the results of recent statistical-epidemiological studies that witnessed long-term harmful effects of electromagnetic waves emitted from cordless and mobile phones. The bearing of this case is limited to a specific pathogenic factor (electromagnetic waves of mobile phone frequencies) and a single pathology concerning a particular area of the body (neurinoma of the fifth cranial nerve) [25]. Moreover, in upholding the appeal decision, the Supreme Court of Cassation repeatedly stresses the specificity of the relevant case, namely that the use of the mobile phone was very intensive and sustained over ten years. Nevertheless, this case has set a precedent [26] to which reference may be made in the future as it was asserted at the highest judicial level. Given the enormous increase in recent years of the use of mobile phones, this case may unfortunately have some significant consequences.

Italian trial rules allow courts to choose freely their technical consultants, from official lists, and to motivate quite freely the acceptance or the refusal of the technical consultant's findings [27]. It is interesting to note that the Supreme Court

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[25] Neurinoma is a benign tumour, but it causes persistent disabling symptoms after treatment with neurological impairment that severely affects the daily life. It must be noted that this Supreme Court judgment has rejected a plea on behalf of INAIL based on the non-assimilation of auditory nerve neurinoma, subject-matter of the recent aforesaid epidemiological studies, to the same disease of the adjacent fifth cranial trigeminal nerve (especially the so-called ganglion of Gasser) that had affected the plaintiff.

[26] Indeed, another precedent is available, which was neither legal nor related to mobile phones: see Corte Conti Lazio, 7 May 1998, no. 486, in *Foro Italiano Rep.*, 1999, *Pensione* [4880], no. 306, that found that a lymphoblastic lymphoma cancer depended on a service duty cause, because of continuous and close-range exposure to electromagnetic fields (in this case it was a police officer in charge of performing continuous maintenance to high-radiation electric and electronic equipment).

[27] On the delicate relationship between judge and technical consultant in Italian civil proceedings, in relation to the need to prevent the entry of groundless scientific opinions in the courtroom, see M. TARUFFO, *Considerazioni su scienza e processo civile*, in G. COMANDÈ and G. PONZANELLI (edited by), *Scienza e diritto nel prisma del diritto comparato*, Turin, Giappichelli, 2004, pp. 489-494, and, by the same author, *Senso comune, esperienza e scienza nel ragionamento del giudice*, in *Rivista trimestrale di diritto e procedura civile*, 2001, p. 687 ff. The debate on scientific evidence is much more developed as regards criminal law: recently, cf. L. DE CATALDO NEUBURGHER, *Scienza e processo penale: linee guida per l'acquisizione della prova scientifica*, and *La prova scientifica nel processo penale*, Padua, Cedam, respectively, 2010 and 2007, as well as F. CAPRIOLI, *L'accertamento della responsabilità penale "oltre ogni ragionevole dubbio"*, in *Rivista italiana di diritto e procedura penale*, 2009, p. 56 ff.

expressly endorsed the Court of Appeal's idea that the medical publications [28], on which the technical consultant of Appeal had based his conclusions, although they did not reflect a consolidated view among scientists [29], were preferable to the publications proposed by the expert witness appointed by the social security Institute, not only because the former publications were more updated, but also because they were not co-financed by mobile phone producers. With regard to this last consideration, the judgments of the Supreme Court and Court of Appeal appear indeed hasty, as they did not distinguish among the different research funding mechanisms (aimed at preventing interference from the financiers) [30].

There are also earlier rulings regarding the cancer risk posed by electromagnetic fields [31]. However, such rulings addressed only precautionary matters, for example concerning inhibitory action against emissions (under Article 844 of the Italian Civil Code [32]). The recent decision by the Supreme Court is the first

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[28] The court also mentions some studies, probably not known at the time of the first instance technical consultancy, specifically: L. HARDELL, M. CARLBERG, *Mobile phones, cordless phones and the risk for brain tumours*, in *International journal of oncology*, July 2009, 35, 1, pp. 5-17, available in the journal's website *www.spandidos-publications.com/ijo/35/1/5*, as well as M. KUNDI, *The controversy about a possible relationship between mobile phone use and cancer,* in *Environ health perspectives*, 2009, March, 117, 3, pp. 316-324. For an up-to-date summary of these studies and many other references, see L. HARDELL, M. CARLBERG, D. GEE, *Mobile phone use and brain tumour risk: early warnings, early actions?*, in EUROPEAN ENVIRONMENT AGENCY, *Late lessons from early warnings: science, precaution, innovation*, Luxembourg, 2013, p. 509 ff.

[29] See World Health Organization, Fact sheet no. 193/2011, in *www.who.int/mediacentre/factsheets/fs193/en*.

[30] A public debate took place on the not-always-clear co-financing of epidemiological studies on electromagnetic fields that even triggered the intervention of the European Economic and Social Committee: in the aforementioned opinion of December 2011 for the adoption of new Directive, the need was stressed to strengthen the independence of the members of the scientific bodies which test the effects of electromagnetic fields and establish exposure limits to protect workers' health. For an in-depth report, see R. STAGLIANÒ, *Toglietevelo dalla testa. Cellulari, tumori e tutto quello che le lobby non dicono*, Milan, ChiareLettere, 2012.

[31] See for example Cass. 23 January 2007, no. 1391, *Foro italiano*, 2007, I, c. 2125, with a comment by F. MATTASSOGLIO, *Tutela della salute e inquinamento elettromagnetico: quale valore per i limiti legali?*, and Court of Venice, section III, 18-19 February 2008, in *Nuova giurisprudenza civile commentata*, 2008, I, p. 1169, with a comment by R. GELLI, *Le immissioni elettromagnetiche tra mera possibilità e ragionevole probabilità di danno alla salute*. With regard to scientific evidence on childhood leukemia, see Court of Appeal Milan 31 August 2009, no. 2168, section II, in *Rivista giuridica dell'ambiente* 2010, 2, p. 355, with a comment by M. CERUTI, *La tutela della salute dai campi elettromagnetici generati va garantita al di là dei parametri imposti dal D.P.C.M. 8 luglio 2003, ad oggi non aggiornati*; Court of Como 23 November 2005, in *Foro italiano*, 2007, I, c. 222. For an overview, I. CARMASSI, *Emissioni elettromagnetiche: tutela della persona e principio di precauzione*, in *Danno e Resp.*, 2008, p. 726 ff.; as well as F. PLEBANI, *Il danno da onde elettromagnetiche: tutela legislativa e giudiziaria*, in *La responsabilità civile. Tredici variazioni sul tema*, edited by G. PONZANELLI, Padua, Cedam, 2002, p. 128 ff; a (singular but consistent) result of the precautionary principle regards the quantification of compensation and damage arising from compulsory servitude of land with power lines for public services, as the Supreme Court has determined that one must also take into account the decrease in market value caused by the fact that the existence of electromagnetic fields does have in any case a negative impact on the «average» buyer's willingness to purchase: so Cass., section I, 29 October 2010, no. 22148, in *De Agostini professionale (on line data base)*.

[32] Article 844 of the Italian Civil Code states that «The owner of a property cannot prevent the emission of smoke or heat, fumes, noise, the shaking and like propagations from the neighbor's property, provided the foregoing does not exceed normal tolerance, also taking into consideration

definitive one which grants compensation for personal injury due to an oncologic disease.

In any case, it shall be noted that the relevant decision of the Italian Supreme Court concerned neither a judgment for damages against the employer within contract law nor liability within tort law. In these instances other factors would have played important roles, such as the subjective culpability of the defendant, also in relation to the technical-scientific culture of the time, or the qualifying of the activity as «dangerous» under the Italian Civil Code [33], or the conformity of the device to technical rules anchored to special national or international standards [34]. Nor was it a criminal law decision [35], which would have led to further issues and would have been based on a higher standard of proof [36] (criminal case law on the irradiation of electromagnetic fields exists, but it regards mainly minor offences arising from exposure thresholds' exceeding [37]).

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the condition of the place»: see M. TAMPIERI, *Le immissioni*, in P. CENDON (directed by), *Trattato dei nuovi danni*, Padua, Cedam, vol. V, 2011, p. 566 ff.

33 Article 2050 of the Italian Civil Code states that «Whoever causes damage to others while performing a dangerous activity, by its nature or the nature of the means used, is liable for damages unless he/she can prove to have taken appropriate measures to prevent the damage»: see AA.VV., *Artt. 2043-2053. Fatti illeciti: generalità, responsabilità per fatto altri, attività pericolose, danni da cose, da animali, da rovina di edificio*, Milan, Giuffrè, 2008; P. RECANO, *La responsabilità civile da attività pericolose*, Padua, Cedam, 2001; M. FRANZONI, *La responsabilità oggettiva. 2. Il danno da cose, da esercizio di attività pericolose, da circolazione di veicoli*, Padua, Cedam, 1995.

34 As regards consumers' law issues of this legal case, see E. AL MUREDEN, *Uso del cellulare - Danni alla salute: la responsabilità del produttore tra dannosità "tollerabile", principio di precauzione e nuovi obblighi informativi*, in *Corriere giuridico*, 2013, p. 330 ff.

35 As regards the differences in causation rules between private law and criminal law in Italy, see R. BLAIOTTA, *Causalità e colpa: diritto civile e diritto penale si confrontano*, in *La responsabilità civile*, 2009, p. 261 ff. With specific reference to issues concerning health and safety on work, see P. TULLINI, *Tutela civile e penale della sicurezza del lavoro: principi, categorie e regole probatorie a confronto*, in *Rivista trimestrale di diritto e procedura civile*, 2011, p. 730 ff., who underlines the points of convergence of the two systems.

36 See Cass. 11 January 2008, no. 584, in *Foro italiano*, 2008, I, c. 451 ff., with a comment by A. PALMIERI. On the «insuperable distinction between the standards of proof applicable in criminal and civil proceedings: the rule of "beyond reasonable doubt" and the less stringent rule of "more likely than not"», see also the studies of F. STELLA: for this quote, see *A proposito di talune sentenze civili in tema di causalità*, in *Rivista trimestrale di diritto e procedura civile*, 2005, p. 1159 ff. See also U. PIOLETTI, *Causalità (rapporto di)*, in *Digesto delle discipline penalistiche*, Turin, Utet, 2008, t. I, p. 77 ff., and R. BLAIOTTA and G. CANZIO, *Causalità (diritto penale)*, in S. CASSESE (directed by), *Dizionario di diritto pubblico*, Milan, Giuffrè, 2006, p. 829 ff. As regards the constitutional limits in the use of the precautionary principle in Italian criminal law, see E. CORN, *Il principio di precauzione nel diritto penale: studio sui limiti all'anticipazione della tutela penale*, Turin, Giappichelli, 2013, p. 21 ff., and F. CONSORTE, *Principio di precauzione e tutela penale: un connubio problematico*, Bologna, Bonomo, 2012, p. 29 ff. As regards causation and scientific doubts in criminal case law, an amount of precedents is available about asbestos: recently see B. DEIDDA, *Causalità e colpa nella responsabilità penale nei reati di infortunio e malattia professionale*, Working papers di Olympus, 19/2013, p. 4 ff.

37 The most famous criminal case law on electromagnetic pollution is that about the proceedings against Radio Vaticana: see Cass., section III, 24 February 2011, no. 23262, in *Rivista italiana di medicina legale*, 2011, 1218, and Cass., section III, 13 May 2008, no. 36845, in *Foro italiano*, 2009, II, c. 262, with a comment by G. FIANDACA, *Inquinamento elettromagnetico e rilevanza penale: questione approfondita ma non risolta*; see also A. SCARCELLA, *Elettrosmog e codice penale: l'epilogo del caso di «radio vaticana» rende definitiva la scelta di campo (elettromagnetico)*, in *Giustizia penale*, 2012, II, p. 415; L. GIZZI,

In litigation on the right to an annuity for an employee's disease paid by the Italian competent social security Institute (INAIL), the judgment purely consists in blaming a pathology on a work factor, without considering illegality or reprehensibility of the relevant factor [38].

4. *Scientific progress and open legal system for the recognition of occupational diseases*

This court case is emblematic of the current situation of conflicting pressures to which the public protection system is subject with respect to occupational diseases. On the one hand, there is the urgent need to control increasing spending, in a period of welfare state's financial crisis. On the other hand there is growing demand for public insurance coverage, as the advancement of medical and scientific knowledge allows to acquire awareness of the etiology on a growing number of diseases and, therefore, to broaden the range of those attributable to work reasons [39].

Extending compensation to a growing range of occupational diseases is also an innate effect on Italian legislation. The current system contemplates a dual alternative mechanism in recognizing the causality link with work factors.

In the first place are the lists of known occupational diseases, which are updated periodically [40]: for these diseases it is sufficient to provide an administrative application documenting the non-sporadic or occasional exposure on the job to the listed pathogenic factor. The addition of the disease to the aforementioned lists provides a legal presumption, which basically makes it unnecessary to verify in actual fact the causal link between work and health. Especially as concerns diseases of multifactorial origin, it is very difficult for the social security Institute

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La rilevanza penale dell'emissione di onde elettromagnetiche ai sensi dell'Art. 674 c.p.: interpretazione estensiva o applicazione analogica della norma incriminatrice, in *Cassazione penale*, 2009, 3, p. 969.
Very few Italian criminal cases are on (only minor) personal injuries by electromagnetic fields; for a precedent that has recognized the causal link with a headache, see Cass., section IV, 22 November 2007, no. 33285, in *Rivista giuridica dell'ambiente*, 2008, 6, p. 1001, with a comment by M.A. MAZZOLA, *La Corte di Cassazione penale conferma il nesso di causalità tra cefalea ed esposizione ad inquinamento elettromagnetico da ELF*.

[38] With regard to the differences between the role of this social security coverage and employers' responsibilities in the Italian legal system, see G. LUDOVICO, *Tutela previdenziale per gli infortuni sul lavoro e le malattie professionali e responsabilità civile del datore di lavoro*, Milan, Giuffrè, 2012, p. 91 ff.

[39] In fact, the Annual Report of 2010/2011 published by INAIL, p. 81, indicates an increasing occurrence of occupational diseases with multifactorial origins and long latency periods; cf. also P. CONTE, A. GOGGIAMANI, A. OSSICINI, *La denuncia/segnalazione delle malattie correlate al lavoro: una sintesi sull'attualità*, in *Rivista degli infortuni e delle malattie professionali*, 2009, I, p. 571, and A. FIORI, *La causalità nelle malattie professionali*, in *Rivista italiana di medicina legale*, 2006, p. 784.

[40] See the lists in Ministerial Decree of 9 April 2008; cf. also the Decree of the Min. of Labour of 11 December 2009 which updates the list of diseases for which the statement to public authorities is mandatory.

to demonstrate the extra-occupational origin [41] (on the so called principle of 'equivalence of the contributory causes', see *below*).

Secondly, Article 10(4) of Legislative Decree no. 38 of 2000 grants the worker the opportunity to obtain insurance coverage for other diseases for which he/she can prove the occupational origin. This additional channel was introduced further to a leading case law of the Italian Constitutional Court that imposed the extension of social mandatory insurance to occupational diseases (other than those tabulated), for which the work cause can be established [42]. The worker is responsible for enclosing his/her evidence and scientific documentation. The competent social security Institute must then collect any further element of investigation reasonably useful to assess occupational etiology. Any refusal by the Institute may then be challenged by the worker in court, where the principle that the burden of proof lies with the plaintiff [43] applies.

However, the distinction between the two channels for the recognition of the occupational nature of a disease is not that simple. The legal presumption of causality attached to the listed occupational diseases binds only to the extent specified in the list: i.e. it works only in cases in which there is an identified link between a given disease and an identified job [44]. It's possible to recognize the

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[41] See for instance Cass. 21 December 2009, no. 26893, in *Foro italiano (on line data base)*. The need of an exclusive or prevalent extra-occupational origin is a controversial issue: see also Cass. 26 July 2004, no. 14023, in *Foro italiano*, 2005, I, c. 422.

[42] Constitutional Court no. 179 of 1988, in *www.cortecostituzionale.it*; for a framework about it, please refer to M. CINELLI, *Diritto della previdenza sociale*, Turin, Giappichelli, 2012, p. 505 ff.; R. PESSI, *Lezioni di diritto della previdenza sociale*, Milan, Cedam, 2012, p. 591 ff.; M. PERSIANI, *Diritto della previdenza sociale*, Milan, Cedam, 2011, p. 193 ff.; for a wider explanation see A. DE MATTEIS, *Infortuni sul lavoro e malattie professionali. Seconda edizione aggiornata al Collegato lavoro*, Milan, Giuffrè, 2011, pp. 504-518.

[43] Article 2697 of the Italian Civil Code states: «Whoever wants to enforce a right in court must prove the facts on which it is based. Whoever pleads the invalidity of such facts or claims that that right has changed or terminated must prove the facts on which the objection is based». The first paragraph of Article 115 of the Code of Civil Procedure states that «Except as otherwise provided by law, in order to justify its decision, the court must base its decision on evidence submitted by the parties or the public prosecutor, as well as the facts not specifically alleged by the defendant».

[44] Legal presumption operates in part if in the official tables the disease is not named but generally identified with reference to a macro-category or to the pathogenic factor. These are mainly the cases in which the table refers to «other diseases caused by occupational exposure to ...»: e.g.: Cass. 5 September 2006, no. 19047, cited above; on this matter S. SENESE, *Esposizione a rischio e nesso di causalità nelle malattie a genesi multifattoriale*, reported at the national seminar of INAIL's lawyers in 2006, in *Rivista degli infortuni e delle malattie professionali*, 2007, I, pp. 2-10; M. ALTIMARI, *Malattie a eziologia multifattoriale e presunzione legale di origine professionale*, in *Rivista giuridica del lavoro*, 2010, II, p. 341. Legal presumption also operates in part if the table expresses a link between disease and pathogenic factor, but it remains to be demonstrated that the job exposed the plaintiff to the factor itself or that it belongs to the category (chemical usually) listed in the tables generically. This mainly includes cases in which the table only mentions «all the productive processes that expose to ...»; e.g. cf. Cass. 13 July 2011, no. 15400, and Cass. 30 December 2009, no. 27752 (on a cancer case, allegedly linked to ionizing radiation, which confirmed the judgments that had denied the causal link on the basis of the expert's report which had found that the exposure of the applicant, a female doctor of a radiology ward, was within the limits of the law),

existence of a third intermediate channel to access this social protection, since the case law tends to extend legal presumption to diseases similar to those expressly contemplated by the law [45]: in such cases, the assessment of the scientific assimilability is required between the complained pathology and the one which is contemplated by law.

This open (so-called mixed) legal system for the recognition of occupational diseases requires courts to deal with the language and methodology of 'hard sciences' to the extent in which the presumption attached to the listed diseases does not apply to the relevant case. Specifically, the judge must evaluate each time the most updated studies relating to the pathology in question. This is precisely what occurred in the matter that ended with the aforementioned ruling of the Supreme Court of October 2012.

5. *The statistical-epidemiological criterion in Italian social security law*

In medicine, there are frequent cases in which it is not possible to verify the specific historical event, which caused a certain disease. This is particularly true in oncology [46] where, basically, it is not possible to know exactly when and how a given cell acquired a mutagenic nature. In addition, it may occur that an increased incidence of a certain disease is linked to one occupational factor without the specific pathogenic mechanism being already known.

In such cases, it is not possible to use the traditional legal theory of causation, according to which, that which causes an event is its *condicio sine qua non*, i.e. everything that cannot be eliminated mentally without the event in question failing (theory that in any case needs to be combined with one of the 'proximate cause' tests elaborated in case law). In fact, the use of this concept demands a twofold knowledge: in the first place that the allegedly pathogenic factor may be such, in general, and secondly that the allegedly pathogenic factor was actually such in the specific case [47].

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both in *Foro italiano (on line data base)*; Cass. 15 May 2007, no. 11087, in *Rivista critica di diritto del lavoro*, 2007, p. 931, with a comment by A. GARLATTI, *Sistema «tabellare» delle malattie professionali, presunzioni legali e onere della prova per il riconoscimento dell'indennizzo*. Also see INAIL Circulars no. 47 of 24 July 2008 and no. 7876/bis of 16 February 2006.

[45] G. FONTANA, *«Causalità giuridica», ovvero l'arte di governare l'incertezza. Un caso emblematico: il dato eziologico nelle malattie professionali*, in *Rivista di diritto della sicurezza sociale*, 2010, p. 42.

[46] See G. OBE, B. JANDRIG, G.E. MARCHANT, H. SCHÜTZ, P.M. WIEDEMANN, *Cancer Risk Evaluation: Methods and Trends*, Wiley-Blackwell, 2011, chapter 21 with regard to electromagnetic fields' issues.

[47] On the distinction between general causality and particular causality, cf. for all, F. STELLA, *A proposito di talune sentenze*, work cited, p. 1160 ff. This debate dealt mainly with the criminal law: see M. MAIWALD, *Causalità e diritto penale: studio sul rapporto tra scienze naturali e scienza del diritto*,

Within the framework of radiation protection, there is a tendency to distinguish between so-called deterministic effects and so-called stochastic effects, i.e. probabilistic. The former are characterized by the presence of a threshold, beyond which the consequences resulting from exposure generally increase in proportion to its extent and duration, on equal terms with the other parameters. In the case of electromagnetic fields, the deterministic effects derive mainly from high exposures.

Conversely, there are no thresholds for stochastic damage. Furthermore, since these are non-thermal effects they are hardly measureable (not being able to refer to temperature as the physical energy transfer indicator between a radiation field and a biological receptor, the electromagnetic field can be measured but the exposure to same is not directly measurable). Moreover, since stochastic effects tend to occur in the long term, i.e. have a latency time of years, it is somewhat difficult to ensure that in this period of time other contributory causes can be excluded. The important aspect is that, as regards the stochastic effects, the level of damage is not proportional to the amount of exposure over time. In other words, the effect is probabilistic, i.e. it either appears or does not appear [48].

If, therefore, the disease is a probabilistic effect, the finding of a causal link can only be based on the survey on the degree of probability with which the pathogenic factor can cause the disease. The result of this measure is expressed as a number: «relative risk». This notion consists in calculating the increase of riskiness due to the exposure to the given pathogenic factor, i.e. the ratio between the incidence rates among people exposed and those not exposed (to the numerator and the denominator of the numeric fraction, respectively) [49]. If the factor, the pathogenicity of which is assumed, actually increases the likelihood of becoming ill, this numerical ratio will be greater than the unity. Hence the court's question to the technical consultant, who is called both to verify the existence, in literature, of a scientific coverage rule having at least a high degree of statistical validity and verify the case's factual level of subsumption in the aforementioned scientific rule.

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translated by F. BRUNETTA D'USSEAUX, 1999, p. 21 ff., as well as the contributions in the volume edited by C. DE MAGLIE and S. SEMINARA, *Scienza e causalità*, Padua, 2006, and those in the volume edited by R. PUCELLA and G. De SANTIS, *Il nesso di causalità. Profili giuridici e scientifici*, Padua, 2007, in particular G. DE SANTIS, *La causalità penale al cospetto della scienza: morte e palingenesi di un dogma*, p. 50-65.

[48] See for example G. TRENTA, *Malattie da lavoro e rapporto di causalità*, in *Igiene e sicurezza sul lavoro*, 2008, p. 346 ff., which refers specifically to radiation protection, and by the same Author, *Il significato del detrimento in radioprotezione*, in *Igiene e sicurezza sul lavoro*, 2009, p. 198 ff.

[49] The relative risk is the statistic generated by prospective cohort studies. Similar configuration is that of retrospective studies, which select two groups of subjects based on their disease status (cases and controls) and look back through time at potential exposures that both groups may have encountered; the statistic generated is the so called odds ratio: the ratio of the odds of exposure in the cases to the odds of exposure in the controls. The "confidence interval" is also a relevant number, showing the uncertainty of the statistical estimate.

The adoption of the described 'statistical-epidemiological' criterion is widespread in Italian case law [50]. It being understood that mere judicial presumptions are not usable in this regard [51] and that the mere causation possibility by the indicted work factor is not enough [52], case law acknowledges that there is no need for absolute certainty, especially when these are multifactorial diseases [53].

In the dispute under review, the expert appointed by the Court of Appeal had considered that the extent and duration of electromagnetic radiation to which the worker had proved his left ear had been subjected, because of his job (5 to 6 hours a day for over a decade), led to believe that the relative risk of being struck by that rare neoplastic disease was equal to 2.9 (dissenting from the technical consultancy of the Labour Court, which did not find evidence enough). In other words, the plaintiff was subjected to a risk nearly three times the normal one: a high increase of a risk that was, however, very remote but that actually occurred in this case. Accepting these conclusions of the expert, the appeal decision, confirmed by the Supreme Court, recognized the existing causal link useful in the acknowledgement of the occupational origin of the disease.

It has to be pointed out that in Italy there is no legal rule indicating the minimum relevant risk (e.g. in some jurisdictions the most innovative case law assigns causal relevance to the exposure when it has at least doubled the risk, so that it is 'more likely than not' that it caused the injury) [54]. In the Italian court case in question, not even an expressed threshold was declared: the courts decided that the factor of 2.9 calculated by the expert, i.e. a nearly threefold increase in the likelihood of becoming ill, represented a relative risk such as to recognize the causal link. However, they did not state what is the minimum threshold below which the occupational origin would not have been recognized.

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[50] E.g. Cass. 3 August 2012, no. 13956, in *http://olympus.uniurb.it*; Cass. 5 September 2006, no. 19047, in *Rivista italiana di medicina legale*, 2008, p. 342, with a comment by M. BARNI, *Malattie professionali e nesso causale: almeno cinque condizioni valutative*; Cass. 27 April 2004, no. 2073, in *Rivista giuridica del lavoro,* 2005, II, p. 201, with a comment by G. SACCONI, *La prova del nesso causale nelle malattie multifattoriali: l'importanza del criterio epidemiologico*; also see P. TULLINI, *Giurisprudenza penale e del lavoro. Introduzione*, and A. VISCOMI, *Amianto: precauzione, prevenzione e responsabilità*, both in L. MONTUSCHI and G. INSOLERA (edited by), *Il rischio da amianto. Questioni sulla responsabilità civile e penale*, Bologna, Clueb, 2006, p. 123 ff. and pp. 52-56.

[51] E.g. Cass. 26 June 2009, no. 15080, in *Foro italiano (on line data base)*.

[52] E.g. Cass. 21 June 2006, no. 14308, in *Foro italiano (on line data base)*.

[53] See, precisely with respect to the tumor, Cass. 27 November 2007, no. 24637, in *Diritto e pratica del lavoro*, 2008, p. 816, with a comment by J. LA MENDOLA, *Malattie professionali e nesso causale.*

[54] As regards the last developments in UK House of Lords case law, see C. MILLER, *Causation in Personal Injury after (and before) Sienkiewicz*, in *Legal Studies*, Vol. 32, No. 3, September 2012, p. 411, in *http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2176108*. For a reference on US law, see M.D. GREEN, *Second Thoughts on Asbestos Apportionment*, in *Southwestern University Law Review*, Vol. 37, No. 3, 2008, in *http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1345162*. For a reflection on causality percentages, see S. FUSELLI, *Apparenze. Accertamento giudiziale e prova scientifica*, Milan, FrancoAngeli, 2008, p. 34 ff. *passim*, that also offers comparative references of the gradual shift from «certain to credible» in the judges' methods.

Setting a minimum threshold may seem unnecessary for this case (nor can we expect an excessively 'mathematical' approach from judges, which could create incomprehensible weaknesses in social security coverage). Nonetheless an identification of the threshold of significant increased risk would have been useful from the general point of view not only for reasons of legal certainty, but also to make a comparison between minimum exposure, relevant for mandatory social insurance purposes, and effective exposure to which citizens are subjected. The outcome of such a comparison may act as a stimulus for greater application of the precautionary principle, both for any legislative interventions and in the daily choices of citizens [55].

6. *(Continued) Concurrence of extra-occupational circumstances of exposure to electromagnetic fields*

Other questions, which may arise concerning electromagnetic fields as the cause of occupational diseases, are linked to possible significant exposure for non-business reasons.

It is known that the majority of people are now exposed to the electromagnetic radiation of wireless telephone handsets for non-business reasons, as holders of their own mobile or cordless phone. This is irrelevant to coverage under the Italian mandatory social insurance scheme run by INAIL: Italian courts hold applicable, also outside the criminal law field, the principle of 'equivalence of contributory causes', established in Criminal Code Article 41. According to this principle the concurrence of causes, preexisting or simultaneous or occurred, even if independent, does not in itself exclude the causal relationship, which fails only when the causes were «in themselves sufficient to determine the event» [56].

This principle of equivalence of contributory causes also applies to the occupational etiology test useful for benefits paid by INAIL [57], unless it is

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[55] In a not too distant future, a high degree of awareness could be reached, even by non-specialized public, on some kind of harm from the use of mobile phones. In such a case, all consequences will be evaluated, such as, for example, under civil damages from product (on this problematic aspect concerning the consent, or at least the awareness, of the victim, cf. G. BALDINI, *Il danno da fumo. Il problema della responsabilità nel danno da sostanze tossiche*, Naples, Edizioni Scientifiche Italiane, 2008, p. 257 ff.). However, from Italian labour law's point of view, one can exclude as of now the possibility that the employee be charged with any kind of contributory or comparative negligence in using the company's mobile phone.

[56] On the application of this principle in Italian tort law, cf., even for a critical review, M. CAPECCHI, *Il nesso causale. Da elemento della fattispecie fatto illecito a criterio di limitazione del risarcimento del danno*, Padua, Cedam, 2005, especially p. 214 ff., and R. PUCELLA, *La causalità «incerta»*, Turin, Giappichelli, 2007, p. 170 ff.

[57] E.g. Cass. 1 June 2007, no. 12875, in *Notiziario della giurisprudenza del lavoro*, 2007, p. 560; Cass. 29 August 2007, no. 18254, in *Rivista degli infortuni e delle malattie professionali*, 2007, II, p. 35; Cass. 19 June 1998, no. 6127, in *Foro italiano (on line data base)*; and Cass. 16 June 2001, no. 8165, Cass.

possible to distinguish which pathological effects can be attributed to occupational reasons and which to extra-occupational reasons. Once the plaintiff has proved the amount of exposure for occupational reasons, beyond which the relative risk is greater than the limit relevant according to the court, occupational etiology is recognized, despite the fact that the plaintiff has been exposed, possibly to a greater extent, to the same pathogenic factor (or another pathogenic factor as well relevant for that disease) for extra-occupational reasons [58]. With regard to tobacco smoking as a possible contributing cause of lung diseases, courts have ruled a number of times [59].

As such, the public insurance system bears the compensation of a number of diseases of which a significant part may not be ascribed, from a statistical point of view, to occupational reasons (and the amount of compensation is not readjusted to the percentage of increased risk ascribable to the occupational pathogenic factor [60]). It is worth noting that this is where the insurance logic of the social security coverage fades away. However this is a democratic choice by Parliament.

As to the concurrence of circumstances, a further question may arise on the promiscuous use of company mobile phones. As it is known, this working tool is sometimes granted also for the employee's personal purposes. In such cases, aside from the difficulty in tracking the percentage of use for working purposes, it is not farfetched to add the observation that the harmful device was in any case provided by the employer. Besides, it is precisely the private use of the company mobile phone that is useful for the employer, because the employee will thus be easy to reach even outside any type of on-call system and also beyond working hours (from which certain professional figures such as executives are also partially exempted in Italy). Nor can the employee be accused of any incorrect use of the device itself, as the emission of electromagnetic radiation comes from its normal use (in this regard it cannot be excluded that in the future it may be

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30 May 2000, no. 7228, Cass. 27 December 1999, no. 14565, Cass. 21 January 1998, no. 535, all in *Foro italiano (on line data base)*, Cass. 6 November 1995, no. 11559, in *Rivista degli infortuni e delle malattie professionali*, 1996, II, p. 20.

[58] See the aforementioned INAIL Circulars no. 47 of 24 July 2008 and no. 7876/bis of 16 February 2006. See for example Cass. 5 February 1992, no. 1237, in *Rivista degli infortuni e delle malattie professionali*, 1992, II, p. 113. It has to be pointed out that in recent times case law seems to be more restrictive about this point, especially when the occupational exposure has not been very extensive: see Cass. 23 aprile 2013, n. 9778, in *De Agostini professionale (on line data base)*.

[59] Eg Cass. 4 June 2008, no. 14770, in *Foro italiano (on line data base)*; Cass. 9 September 2005, no. 17959, in *Rivista giuridica del lavoro,* 2006, II, p. 359, with a comment by S. ASSENNATO, *Multifattorialità: nesso causale e obbligo di protezione. Quale rapporto?*. On this matter the Italian Supreme Court not only confirmed the applicability of the foregoing principle on the equivalence of the contributory causes, but also explicitly rejected INAIL's question of constitutionality, appealing to the fact that smokers end up having privileged insurance protection in relation to diseases of the respiratory system: Cass. 3 May 2003, no. 6722, in *Foro italiano (on line data base)*.

[60] So Court of Turin, 1 October 2009, in *Rivista giuridica del lavoro,* 2010, II, p. 366, with a comment by M. ALTIMARI; Cass. 29 May 2004, no. 10448, in *Rivista critica di diritto del lavoro*, 2004, p. 698, with a comment by A. GARLATTI.

considered appropriate for employers to provide their employees with mobile phones that work only via hands free sets for example).

However, for now, at least, we can refrain from conceiving too many abstract questions, in the hope that the future will not pose them as concrete issues.