



## ANNUAL REPORT 2007

### Objective

The Nederlandse Commissie voor Stralingsdosimetrie (NCS, Netherlands Commission on Radiation Dosimetry) was established on the 3rd of September 1982 with the main objective of promoting the appropriate use of radiation dosimetry, both for radiation research and for practical applications. The NCS is chaired by a board of scientists, installed in consultation with the supporting societies:

- Nederlandse Vereniging voor Radiotherapie en Oncologie (NVRO, Netherlands Society for Radiotherapy and Oncology);
- Nederlandse Vereniging voor Nucleaire Geneeskunde (NVNG, Dutch Society for Nuclear Medicine);
- Nederlandse Vereniging voor Klinische Fysica (NVKF, Dutch Society for Medical Physics);
- Nederlandse Vereniging voor Radiobiologie (NVRB, Netherlands Radiobiological Society);
- Nederlandse Vereniging voor Stralingshygiëne (NVS, Society for Radiological Protection of the Netherlands);
- Nederlandse Vereniging Medische Beeldvorming en Radiotherapie (NVMBR, Dutch Society for Medical Imaging and Radiotherapy);
- Nederlandse Vereniging voor Radiologie (NVvR, Radiological Society of The Netherlands);
- Société Belge des Physiciens des Hôpitaux/Belgische Vereniging voor Ziekenhuisfysici (SBPH/BVZF, Belgian Hospital Physicists Association);
- Nederlandse Vereniging van Klinisch Fysisch Medewerkers (NVKFM)

To pursue its aims, the NCS has the following tasks:

- Participation in dosimetry standardization and promotion of dosimetry; intercomparisons;
- drafting of dosimetry protocols;
- Collection and evaluation of physical data related to radiation dosimetry;
- Maintain or establish links with national and international organizations concerned with ionizing radiation;
- Promulgate information on new developments in the field of radiation dosimetry.

The Commission's website: <http://www.ncs-dos.org/>

secretary:

E. van Dijk, Nederlands Meetinstituut  
Project manager Research&Development  
P.O. box 654, 2600 AR DELFT  
Tel. 015 2691681, Fax. 015 26912971  
e-mail: [evandijk@NMI.nl](mailto:evandijk@NMI.nl)

## Board

On December 31, 2007 the members of the board of the NCS were:

|   |             |
|---|-------------|
| Prof. Dr. S. Vynckier, chairman         | (SBPH/BVZF) |
| Prof. Dr. B.J.M. Heijmen, vice chairman | (NVRO)      |
| Mr. E. van Dijk, secretary              | (NMI)       |
| Dr. J. Zoetelief, treasurer             | (NVRB)      |
| Dr. A.J.J. Bos                          | (NVS)       |
| Prof. Dr. A.A. Lammertsma               | (NVNG)      |
| Drs. J.M. Schut                         | (NVvR)      |
| Dr. Ir. F.W. Wittkämper                 | (NVKF)      |
| Mr. D. Zweers                           | (NVMBR)     |
| Ing. J.M.J. Hermans                     | (NVKFM)     |

The board of the NCS met four times in 2007, on January 23, May 7, October 17 and December 10.

The main subjects raised at the board meetings were:

- monitoring the progress of activities by subcommittees;
- initiate the publication of NCS-reports;
- development of new activities.

In 2007 the NCS has celebrated its 25<sup>th</sup> anniversary with the organization of the 5<sup>th</sup> lustrum symposium. This symposium was organized on October 19<sup>th</sup> in Leiden on "Radiation dosimetry in Medicine: State of the art in 2007".

## Subcommittees

### 1. NCS Subcommittee "Uniformity of Dosimetry Protocols"

The subcommittee 'Uniformiteit Dosimetrieprotocollen' has held two "full subcommittee" meetings in 2007, on March 1 at NMI, Delft and at Hospital Jolimont, Haine-St. Paul.

The goals of the subcommittee are:

- To achieve uniformity of photon and electron dosimetry protocols, based on absorbed dose-to-water standards.
- To draft a Code of Practice (CoP) that is concise, clear, and easy to use in practice.
- To draft a CoP that applies to ionisation chambers and photon and electron beam qualities that are being used in Belgium and the Netherlands.
- To give recommendations for Belgian and Dutch clinical physicists in the final NCS report.

In 2007 the final draft of the report was prepared and discussed within the NCS board. The analysis of the experimental kQ-data set was completed, additional measurements to determine recombination correction factors for the selected Farmer type cylindrical ionisation chambers in Co-60 gamma rays were performed and new data on perturbation factors, for use of selected plane-parallel chambers in electron beams and for direct calibration in Co-60 gamma rays, were studied and analysed. All Farmer type chambers used during the measurement campaign in clinical photon beams were also re-calibrated in the Co-60 reference beam at LSDG (Gent), providing an additional check on the various calibrations of these chambers performed at NMI during the past years.

Comments by members of the NCS board and some medical physicists resulted in various

improvements to the draft report. The improved version of the draft report was presented for external review to Dr. Jan Seuntjens (McGill University, Montreal, Canada) and Prof. Dr. Jan Van Dam (retired from the Catholic University, Leuven). In October 2008 the NCS board approved the draft report with the condition to include comments resulting from the external reviewers.

On May 16, the draft Code of Practice was presented by members of the subcommittee on the Continuous Education day of the BHPA in Gent.

Presentations based on material of the new NCS Code of Practice were given by Hugo Palmans and Tony Aalbers at the 22<sup>nd</sup> Annual Meeting of the BHPA (Liège) in February and by Tony Aalbers at BIPM-LNE LNHB workshop (Paris) in May and at the 5<sup>th</sup> NCS Lustrum symposium (Leiden) in October.

Publication of the NCS Code of practice for the dosimetry of high-energy photon beams and high-energy electron beams is expected early 2008.

Members of the subcommittee are:  
Drs. Tony Aalbers, (chairman)  
Marie-Thérèse Hoornaert M.Sc.  
Dr. André Minken  
Dr. Hugo Palmans  
Dr. Marc Pieksma  
Ing. Leon de Prez  
Prof. Dr. Stefaan Vynckier  
Dr. Frits Wittkämper  
Dr. Nick Reynaert

## 2. Subcommittee "Dosimetry in Radiology"

By October 2006 a complete draft of the report on Dosimetry in Radiology (in Dutch) was agreed upon by the subcommittee "Dosimetry in Radiology". On November 6, 2006 the completed draft was distributed among the members of the board of the NCS for discussion at the next board meeting. The draft was approved early 2007. The Report was published in March 2007 as NCS Report 17 "Dosimetrie in de radiologie: Stralingsbelasting van de patient en werknemers. The subcommittee was discharged.

Membership of the subcommittee:  
Dr. J. Zoetelief (chairman)  
Prof. Dr. J.J. Broerse  
Dr. P.J.H. Kicken  
Mr. W. Teeuwisse  
Ir. W. de Vries  
Mr. D. Zweers

3. *Subcommittee “Loodschorten (Lead Aprons): Protocols for personal dosimetry of workers wearing protective clothing”*

The members of the subcommittee represent the five approved dosimetric services of The Netherlands and the most important professional societies in the field of ionising radiation in combination with protective clothing. In 2006 the first three chapters of the NCS report was written, including exposure conditions in The Netherlands and correction methods for personal dosimetry using single or multiple dosimeters. In addition, the fourth chapter on possible alternatives with respect to the application of protective clothing and other personal protective devices, single or double dosimeters and their wearing positions and correction factors was prepared and discussed.

Members of the subcommittee are:  
Dr. J. Zoetelief (Chairman)  
Dr. J.W.E. van Dijk  
Mr. L. Ebben  
Ir. Y. Franken  
Drs. T. Grimbergen  
Mrs. Ir. W. Hummel  
Dr. Ir. P.J.H. Kicken  
Dr. Ir. F.W. Schultz (secretary)  
Dr. G. Voorhout

4. *Subcommittee: Quality control of low -energy-photon emitting seeds in Brachytherapy*

The subcommittee has gathered four times in 2007, namely on January 11<sup>th</sup>, June 13<sup>th</sup>, September 25<sup>th</sup> and December 13<sup>th</sup>. These meetings were held in Antwerp (Middelheim Hospital) or Utrecht (UMC).

The goals of the subcommittee are:

- To draft a report with recommendations for QC on the use of low-energy-photon emitting seeds in brachytherapy
- To study the current clinical practice and use this as a basis for the report.
- To stimulate the development of a standard for such sources in Belgium and The Netherlands, and promote efforts to make calibration methods at each center traceable to (inter)national measurement standards.

In 2006 the subcommittee had performed on-site visits in the institutions in Belgium and The Netherlands that were using I-125 seeds for prostate implants. During these visits the results of a previously mailed TPS test procedure were collected and source strength measurements were performed.

In 2007 the results of these site visits were studied and interpretation of the results was discussed extensively. The publication of a supplement to the update of the AAPM TG43-recommendations in the June issue of Medical Physics provided the group with supplemental reference data for the treatment planning system (TPS) tests: Rivard MJ, Butler WM, DeWerd LA, Hug MS, Ibbott GS, Meigooni AS, Melhus CS, Mitch MG, Nath R, Williamson JF; American Association of Physics in Medicine.

Supplement to the 2004 update of the AAPM Task Group No. 43 Report.  
Med Phys. 2007 Jun;34(6):2187-205.

With support of the seed manufacturer and Physikalisch-Technische Bundesanstalt (PTB), Germany one last missing calibration factor for our measurement equipment has been

determined for that specific seed.

By the end of the year-beginning 2008 all 31 institutions that participated in the site visits received a written report with the results of the tests and measurements performed at their location.

The site visits showed that many institutions using stranded seeds (typical 10 seeds linked together on a bio-absorbable carrier) routinely performed the seed strength verification measurements on the stranded seeds, rather than measuring individual seeds. This allowed them to perform the verification prior to the clinical intervention and still use these strands for implantation. The specific problem of the interpretation of calibration measurements of such stranded seeds was studied for our calibration equipment. Results showed good agreement with published values. Specific guidelines concerning this issue will be included in the report on recommendations.

During the meetings the preparation of the report on recommendations for quality control of low-energy-photon emitting seeds in brachytherapy was continued and the subcommittee expects to be able to present a draft by the end of 2008.

The results of the on-site visits and the work of the subcommittee were presented at the Annual Symposium of the BHPA (Liège, February 2007), the GEC-ESTRO Meeting (Montpellier, May 2007) and the NCS 5<sup>th</sup> Lustrum Meeting (Leiden, October 2007).

Members of the subcommittee are:

A. Rijnders, (chairman), M.Sc.,  
Drs. A.H.L. Aalbers  
B. Schaeken, M.Sc.,  
M. Debrabandere, M.Sc.,  
Dr. K. Koedooder  
Dr. R. Moerland  
B. Thissen, M.Sc.,  
Dr. Ir. A. van't Riet  
Prof. Dr. S. Vynckier

##### 5. Subcommittee "Quality Control of stereotactic radiotherapy: Recommendations on dosimetry procedures and Quality Control"

In the Netherlands and Belgium there is a rapidly growing number of radiotherapy centers that are being equipped for intracranial as well as extracranial stereotactic radiotherapy. Presently the development of stereotactic radiosurgery (SRS) and stereotactic radiotherapy (SRT) is focused on the imaged guided "frameless" radiotherapy with dedicated linacs (Novalis and Cyberknife), mainly for intracranial lesions. "Frameless" i.e. "without an invasive frame, fixed on the skull of the patient with the aim to fix the patient on the treatment couch". Nowadays, an alternative is a non-invasive mask system with high positioning accuracy in combination with image guided positioning of the patient. As very high fraction doses are delivered in stereotactic treatments and high accuracy in (re)positioning of the tumor with respect to the isocentre is required, stereotactic treatment facilities require higher accuracy levels and more attention to QA than performed for other complex treatments. Therefore, the introduction of stereotactic radiotherapy in the hospital means the acceptance, commissioning and QA of a stereotactic system as an entity. This includes the acceptance, commissioning and QA of the hardware (e.g. linac, mMLC, cone, frames, couch), and software (TPS), as well as the imaging-system and systems for detection and automatic compensation of tumor movements. For the standard QA of the various subsystems NCS reports are available (NCS- 2, NCS-9, NCS-11, NCS-12 and NCS-15). The increasing complexity of SRT/SRS and the increasing number of radiotherapy centers that offer that kind of SRT/SRS treatments justify a NCS report on stereotactic radiotherapy. Specific topics of image-guided

radiotherapy techniques have to be incorporated in relation to stereotactic treatment.

The goals of the subcommittee are to compose a report that provides recommendations for Belgian and Dutch medical physicists on dosimetry procedures and quality assurance for add-on stereotactic equipment as well as for dedicated fully integrated systems.

The report will also give brief descriptions of the present dedicated systems for intracranial and extracranial stereotactic irradiation.

In 2007 the subcommittee had 4 meetings alternately held in Belgium and The Netherlands. A first draft was compiled. Meanwhile the members are preparing other chapters of the report and updating the existing chapter in the drafts.

A prototype phantom is designed and constructed for end to end tests in the hospitals of the members of the subcommittee. This purpose of this prototype is to show the feasibility of such a phantom for the various SRS/SRT treatment techniques.

Members of this NCS subcommittee are:

F. Dessy M.Sc.  
Dr. S. Heukelom  
Dr. H. Marijnissen (chairman)  
A Nulens M.Sc.  
Dr. G. Pittomvils  
Dr. E. Raaijmakers  
Prof. Dr. D. Verellen  
Dr. S. Vieira  
Prof. Dr. B. Heijmen.

## Advisory platforms

The Netherlands Commission on Radiation Dosimetry covers a wide range of expertise through the participating scientific societies. In 1999 NCS platforms were established on dosimetry for radiology and nuclear medicine (chairman J.G. van Unnik) and dosimetry for radiotherapy (chairman J.J. Broerse). The tasks of these platforms are to give advice on specific research projects initiated by the Government. In case of future needs the NCS can be approached for consultation through its secretary under the condition of modest coverage of NCS experts in terms of attendance fee and travel costs for meetings.

Prof. Dr. J.J. Broerse, emeritus chairman

### *Advisory platform "radiology and nuclear medicine"*

In 2007, there was one request for advice in this area.

On request of the Ministry of Health, Welfare and Sport and in cooperation with The Netherlands National Institute for Public Health and the Environment, the diagnostic reference levels in the Netherlands were determined. The results will be published in 2008.

Membership advisory platform 'Radiology and Nuclear Medicine':

Drs. J.G. van Unnik (chairman)  
Dr. J. Geleijns (secretary)  
Prof. Dr. J.J. Broerse  
Dr. J.A.K. Blokland  
Mrs. I. van Helvoort  
Dr. Ir. P.J.H. Kicken  
Ir. A.H.J. Renders  
Mr. W. Termorshuizen

### *Advisory platform "radiotherapy"*

The activities of this subcommittee were discontinued in 2007.

**NCS Balance sheet 31-12-2007**

all amounts in Euro

|                         | debet       |                | credit      |
|-------------------------|-------------|----------------|-------------|
| Savings account         | 11053.93    |                |             |
| Current account         | 655.34      |                |             |
| Belgian current account | 1190.34     | Equity capital | € 12,899.61 |
|                         | -----       |                | -----       |
|                         | € 12,899.61 |                | € 12,899.61 |

**NCS Income and expenses 2007**

## Contributions:

|                       |            |                            |            |
|-----------------------|------------|----------------------------|------------|
| NVvR                  |            |                            |            |
| NVKF                  | € 105.00   |                            |            |
| NVRO                  | € 685.00   |                            |            |
| NVNG                  |            |                            |            |
| NVS                   |            |                            |            |
| NVRB                  | € 75.00    |                            |            |
| NVMBR                 |            | Printing costs NCS reports | € 2,763.42 |
| SBPH/BVZF             | € 50.00    | Banking costs Dutch acc.   | € 31.37    |
|                       |            | Banking costs Belgian acc. | € 11.81    |
| Interest savings acc. | € 153.50   | Maintenance web site       | € 426.05   |
| Interest current acc. |            | Chamber of commerce        | € 21.62    |
| Sales of NCS reports  | € 745.12   | Board and subcommittees    | € 188.90   |
|                       |            | NCS board meetings         |            |
|                       |            | Costs Pb apron             | € 122.44   |
| Balance fifth lustre* | € 4,426.58 | Credit balance             | € 2,674.59 |
|                       | -----      |                            | -----      |
|                       | € 6,240.20 |                            | € 6,240.20 |

\*Printing costs proceedings still to be paid (€ 2196,32)



## NCS FINANCIAL OVERVIEW 2007

|   | <b>Income<br/>(€)</b> | <b>Costs (€)</b> |
|---|-----------------------|------------------|
| Savings-account on December 31, 2006                                | 10900.43              |                  |
| Current-account on December 31, 2006                                | -1606.49              |                  |
| Belgian current-account on December 31, 2006                        | 931.08                |                  |
| Checks and cash on December 31, 2006                                |                       |                  |
| Contribution Netherlands Society for Radiology 2007                 |                       |                  |
| Contribution Netherlands Society for Clinical Physics 2007          | 105.00                |                  |
| Contribution Netherlands Society for Radiotherapy and Oncology 2007 | 685.00                |                  |
| Contribution Netherlands Society for Nuclear Medicine 2007          |                       |                  |
| Contribution Netherlands Society for Radiological Protection 2007   |                       |                  |
| Contribution Netherlands Radiobiological Society 2007               | 75.00                 |                  |
| Contribution Netherlands Society for Medical Imaging 2007           |                       |                  |
| Belgian Hospital Physicists Association 2007                        | 50.00                 |                  |
| Interest savings-account  | 153.50                |                  |
| Interest current account  |                       |                  |
| Capitalisation Belgian current-account                              |                       |                  |
| Sales of NCS Reports  | 745.12                |                  |
| Balance fifth lustre***   | 4426.58               |                  |
| Costs Chamber of Commerce   |                       | 21.62            |
| Banking costs   |                       | 31.37            |
| Banking costs Belgian account                                       |                       | 11.81            |
| Costs of board and subcommittees meetings                           |                       | 188.90           |
| Costs web site  |                       | 426.05           |
| Costs Pb apron  |                       | 122.44           |
| Costs meetings NCS board  |                       |                  |
| Printing costs**  |                       | 2763.42          |
| Non-cashable cheques  |                       |                  |
| Cheques and cash on December 31, 2007                               |                       |                  |
| Savings-account on December 31, 2007                                |                       | 11053.93         |
| Current-account on December 31, 2007*                               |                       | 655.34           |
| Belgian current-account on December 31, 2007                        |                       | 1190.34          |
| <b>Total</b>  | <b>16465.22</b>       | <b>16465.22</b>  |

\* Not including project SZW

\*\* Double payment 576,85

\*\*\*Not including printing costs of proceedings lustre (€ 2196,32)

## NCS BUDGET 2008

|   | <b>Income<br/>(€)</b> | <b>Costs (€)</b> |
|---|-----------------------|------------------|
| Contributions scientific societies        | 1600.00               |                  |
| Interest savings-account                  | 150.00                |                  |
| Sales of NCS Reports                      | 800.00                |                  |
| Costs Chamber of Commerce                 |                       | 25.00            |
| Banking costs                             |                       | 100.00           |
| Costs of board and subcommittees meetings |                       | 0.00             |
| Costs web site                            |                       | 425.00           |
| Costs of printing NCS Reports             |                       | 2000.00          |
| <b>Total</b>                              | <b>2550.00</b>        | <b>2550.00</b>   |