BEAM PIPE FOR *NA61* VTPCS

G.FEOFILOV, S.IGOLKIN
ST.PETERSBURG STATE UNIVERSITY

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Reported by G.Feofilov at the NA61 meeting 26.01.08, JINR – via EVO

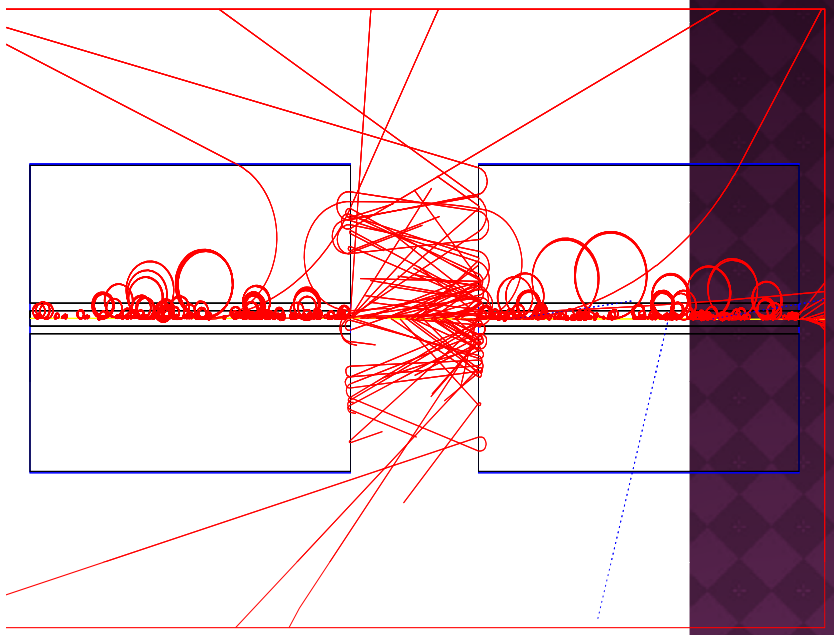
1) INTRODUCTION

- Delta-electrons produced in the beam-gas interactions between split field cage area inside the VTPCs could easily “leak” to the active area,

  piling up and forming

  an unnecessary permanent background

(see more details in the reports by S.Igolkin,V.Kondratiev, *G.Feofilov at the NA49-future meetings 24.08.06, CERN) and 24.03.07, CERN)*



- **Fig.1. GEANT simulation of delta-electrons in VTPCs produced by Pb ions of 158 AGeV for the usual NA49 layout (100 events).**

2).CONSTRAINTS ON THE BEAM PIPE DESIGN FOR VTPCS FOR NA61

1) Disassembly or change of position of VTPCs **must be avoided** in order to preserve the currently well know alignment of chambers. Thus only the in-site work with VTPCs on the beam-pipe installation is possible.
2) Thin large area mylar windows of VTPCs **could not be replaced** in the in-site conditions, so the existing films should be preserved.
3) "Clean-room" conditions are to be met in all possible beam pipe assembly operations keeping the inner volume of the VTPCs in safety.
4) Beam pipe materials and performance should not have any influence on the VTPC gas quality
5) Minimum mass requirement is a general VTPC design request: in case of the beam pipe it claims the limitation on the radiation length of all new structures to be below the radiation length of the working gas.

NEW constraints were expressed at the NA61 meeting 24.03.07::

6) Separate N2 gas feeding system for the beam pipe protective layer
7) Double sided fixation on the mylar windows

EXTRA constraints were formulated *at the NA61 meeting 30.10.07, CERN:*

8) Non-conductive materials in the VTPS volume

SATISFIES ALL 8 CONSTRAINTS: "DOUBLE WALL MYLAR BEAM PIPE FILLED WITH HE AT NORMAL PRESSURE AND CONTAINING ADDITIONAL N2 GAS PROTECTIVE LAYER".

2.1. Technical design.

- The general design of the main beam-pipe/gas-envelope interface unit and the double-wall 125 mkm mylar He-filled beam-pipe with protective N2 gas layer is presented on the Fig.2.
- The main inner beam pipe is formed by the ultrasonic welding of 125 mkm mylar sheet and then the ends of the pipe are glued to the low mass glass fiber short cylinders with mylar windows. These input/output windows for the beam particles provide also the hermetic volume for helium.
- The beam-pipe/gas-envelope interface unit (Fig.2.) is the multifunctional module that provides a number of important functions: low-mass support and beam pipe fixation, separation of gases, hermetic sealing.

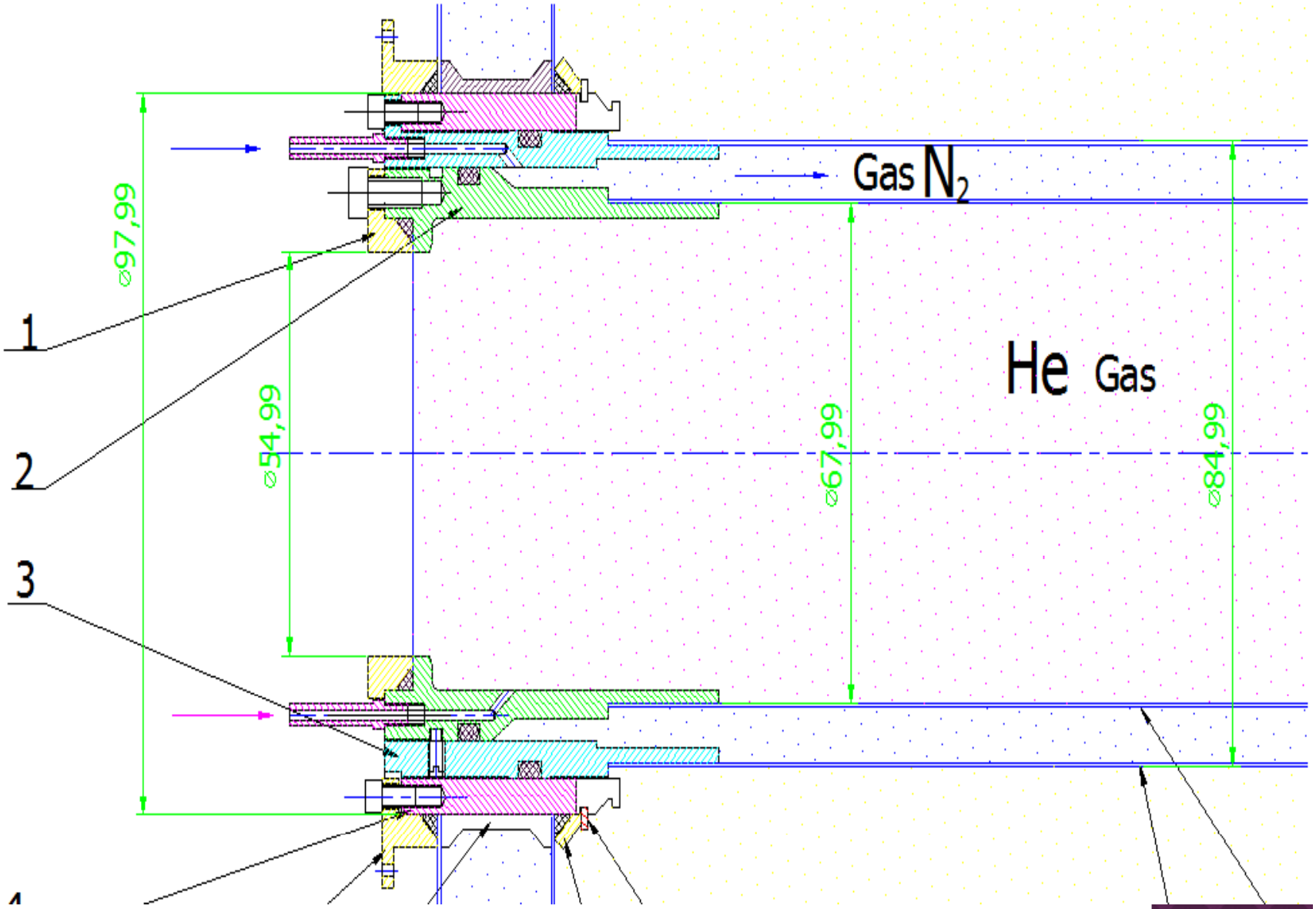
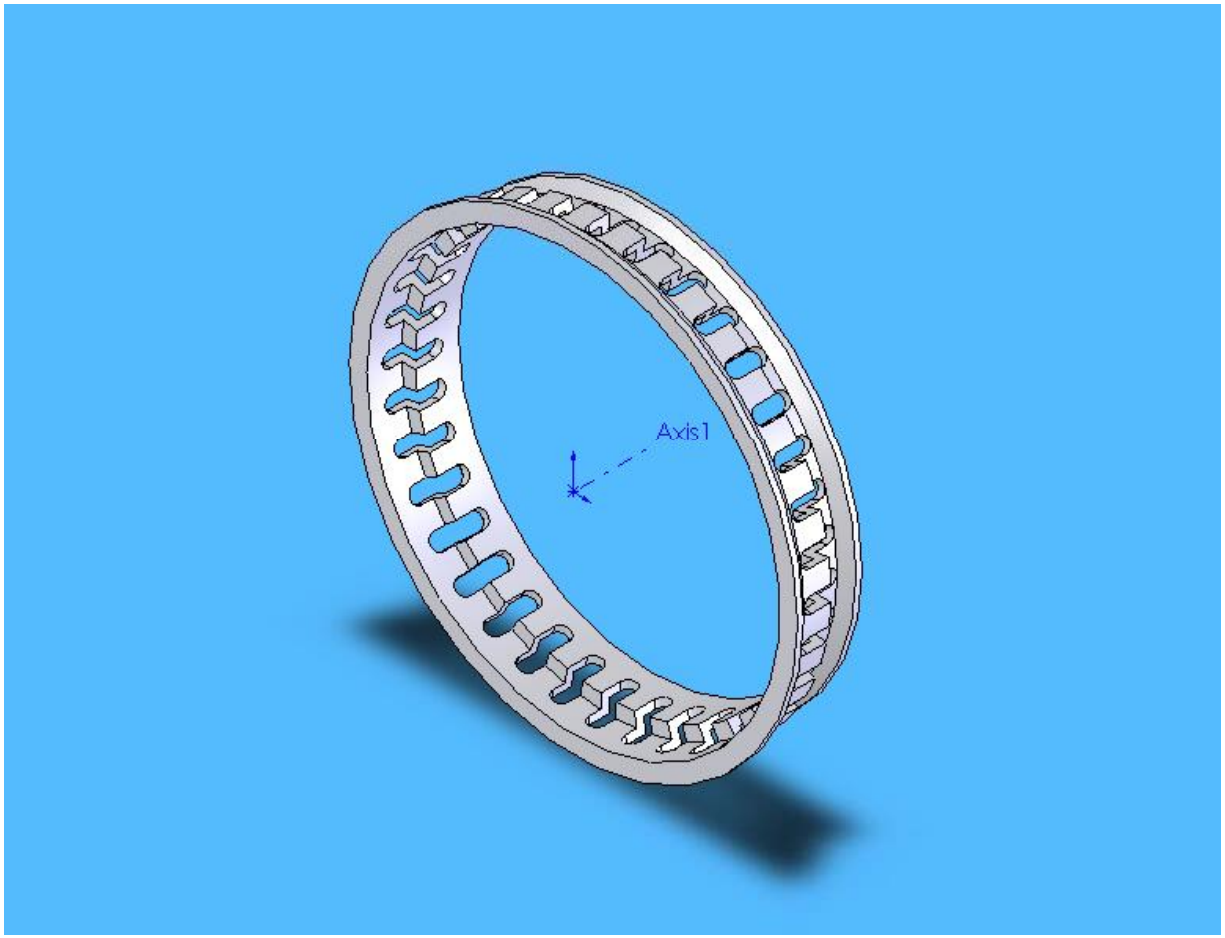
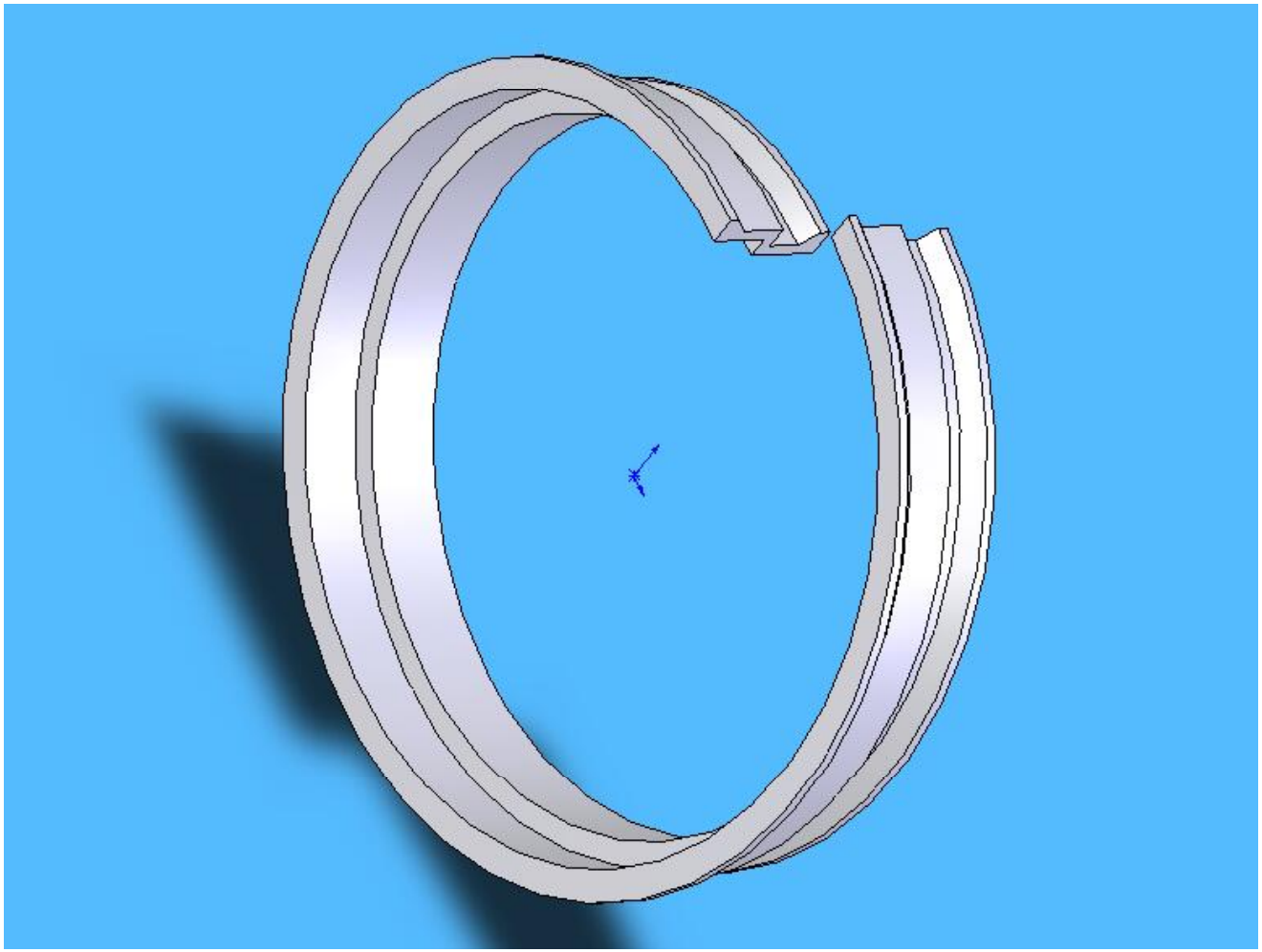


Fig.2. General view of the main beam-pipe/gas-envelope interface unit and the double-wall 125mkm mylar He-filled beam-pipe. Non-conductive plastic is applied (20.01.08)



Special ring to ensure double sided fixation on the mylar windows: circular spring is placed into the smaller diameter groove and then it is shifted into another –larger diam. groove



Insertion of a special ring on the mylar windows

4) WORK SCHEDULE - STILL PRELIMINARY:

- Preparation stage – April or May 2009 ?
- Assembly procedure - July 2009 ?
- Test and commissioning - August 2009 ?

- ? – to be defined by NA61

BACK-UP SLIDES

PREPARATION STAGE - APRIL OR MAY 2009

- Purchase of materials (mylar and chemicals for gluing)
- Preparation of a test facility for gluing quality tests (hermeticity of joints)
- Ultarsonic welding tests for beam-pipe manufacturing
- Tests of gluing regimes
- Final design and work drafts of all elements and units
- Manufacturing of elements
- Assembly and tests using the test facility
- Funding:

  -- materials

  -- lending of ultrasonic welding and other test equipment - ?

  -- 2 month subsistence at CERN (Leading Designer S.Igolkin + G.Feofilov + Zoltan) ?

  -- manufacturing of components according to the drafts and tests

Assembly procedure – In July 2009

1)CUTTING A CIRCULAR WINDOW IN THE 1ST MYLAR VTPC WALL AND GLUING OF THE 1ST INTERFACE RING TO THE 1ST VTPC MYLAR WALL (SEE FIG.3).
2) "CLEAN ROOM" CONDITIONS DURING THIS AND ALL NEXT IN-SITE PROCEDURES LISTED BELOW ARE TO BE MET BY SLIGHT PRESSURIZING OF THE VTPC.
3) THE 1ST INTERFACE RING IS FIXED TO THE CORNERS OF THE VTPC'S FRAME BY USING 4 FISHING LINES.
4) GLUING OF THE 2ND INTERFACE RING OF THIS "ENTRANCE" BEAM-PIPE/GAS-ENVELOPE INTERFACE UNIT TO THE 2ND – I.E. INNER VTPC MYLAR WALL
5) PROCEDURES CITED ABOVE ARE REPEATED FOR THE OUTER TWO VTPC WALLS (ASSEMBLY OF THE "EXIT" INTERFACE UNIT)..
6) HERMETICITY OF GLUED JOINTS OF THE BEAM-PIPE/GAS-ENVELOPE INTERFACE UNIT ARE TESTED WITH THE USE OF DUMMY END-CAPS INSERTED INSTEAD OF THE BEAM PIPE.
7) ASSEMBLY OF THE MYLAR INNER BEAM PIPE FOR HELIUM AND THE OUTER MYLAR PIPE FOR N2 PROTECTIVE GAS AND HERMETIC TESTS OF THE UNIT.
8) INSERTION OF THE BEAM PIPE INN THE WORKING POSITION (THE DIAMETERS OF "THE ENTRANCE" AND "THE EXIT" BEAM-PIPE/GAS-ENVELOPE INTERFACE UNITS ARE SLIGHTLY DIFFERENT IN ORDER TO HAVE AN EASY INSERTION OF THE BEAM PIPE FROM ONE SIDE OF THE VTPC.
9) FIXATION OF THE END-UNITS OF THE BEAM PIPE AND THEIR HERMETIZATION USING THE VITON O-RINGS .

ASSEMBLY PROCEDURE - JULY 2009
FUNDING:

-- materials

-- 2 months subsistence at CERN (Leading Designer S.Igolkin + G.Feofilov) ?

TEST AND COMMISSIONING - AUGUST 2009

- **Final tests of all units on hermeticity.**
- Documentation on the operation of the He-filled double wall beam-pipe and commissioning

- 3 weeks of subsistence for 3 persons