Resumé of Preparation Meeting for CARAD - FP7 at GSI, Darmstadt 25-26 June 2007-06-29

J Morse, morse@esrf.fr

Participants:

E Berdermann (chairperson), M Pomorski, M Ciobanu, Schmidt, GSI Darmstadt	
EBe, representing	MSU, Wits, Vienna/Kurchatov
M Petris	NIPNE Bucharest
A Lohstroh	Univ. Surrey
P Ilinski	Desy-Hasylab (PetraIII)
S Riboldi	Univ. Milan
Ch. Grah	Desy-Zeuthen
M Schreck	Univ. Augsburg
M Nesladek	CEA-Saclay
ML, repr. M Vanecek	IP Prague
R Lovrincic	Univ. Heidelberg
V O'Shea	Univ. Glasgow
G Verona-Rinati	Univ. Roma 'Tor Vergata'
W deBoer	Univ. Karlsruhe
Johm Morse	ESRF

Contributions:

1. A Lohstroh (pp. P Sellin): Interest in graphitized contacts by boron implantation. Polarization studies, CCE and drift time measurements with temperature dependence. Local access to H or He scanning beam of 5µm spot size with sample at 100°~300°K sample stage. Also access (paying) to Imperial College thermal/fast neutron source. Assembling in-house basic lithography (80% complete). Seeks postodoc' funding through CarADD.

2. M Petris: High resolution (<100ps) MIPs timing measurements on single and polycrystal diamond using fast GSI preamps. In-house development of 10ns shaping charge preamplifier for better S/N (for single MIP detection). ^{90}Sr and particle beam detector characterizations. Interest in continuing their contribution on low noise, fast preamplifiers (possibly including ASICs).

3. P Ilinski: Interest in synchrotron beam monitoring applications of SC CVD for PetraIII applications, near identical requirements to ESRF (see below).

4. S Riboldi: Work on very low noise (~20e) charge preamplifiers and shaping for Fano measurement in diamond with collimated alphas. Fast low noise preamp' (<1ns rise, <150e for 5pF, 8µs shaping), large dynamic (0.8GeV) at <500mW.

5. M Ciobanu: Fast discrete component charge preamplifier 650e noise and 0.7ns rise (BW limited by detector wiring layout) for 2pF input stage. Separate fast channel output with <500ps rise. Investigating transmission line spiral, gold on polycrystal, 50Ω on 3 x 3cm^2, as test for position sensitive strip detectors (grain boundary effects etc.)

6. Ch. Grah: Forward region EM calorimeter, diamond detectors for ILC. 15k e+e- pairs (/GeV/bunch crossing) giving detector dose/year ~10MGy. Need wafer scale detectors, coverage is on the scale of one to several m^2; High dynamic range, to detect single particles on a large background. Testing polycrystal materials from Fraunhofer and E6, including radiation tolerance tests at TU-Darmstadt S-Dalinac. Also investigating mCZ Silicon and GaAs. Radiation

tolerance testing at 5, 60…600kGy/hour. With 10MeV electrons, after 7MGy, detectors are still operating but with 70% signal loss at 1V/μm and needing 10Gy priming. Questions raised over high energy electron induced radiation damage: a surprise compared to previous data? Will contribute to lab' and beam tests, radiation hardness of devices and full systems. Also investigating Czochralski grown silicon.

8. M Schreck: CVD diamond heteroepitaxial growth to ~50μm with low film stress on Ir-YSz-Si [100] wafer scale substrates. Problem of seed growth axis tilt rotation on Si is mastered with Ir interface (problem decreases with film thickness). Tests on material by Kohn (Univ. Ulm) showed hetero' material properties approach that of homo' grown single crystal material. Using combined pulsed laser and molecular beam epitaxial deposition on 4" wafers, but nucleation only over ~2cm^2 areas at present. Problems of film release, post processing etc. to be addressed.

9. W deBoer: Beam loss monitors for LHC and diamond beam-exit windows. Expect 10^{15} protons/cm^2/year for LHC monitors. Analysis of Si and diamond radiation damage based on NIEL hypothesis, expect $\Phi_{1/2}$ ~2x10^{15} for 24GeV protons (half signal loss) but $\Phi_{1/2}$ ~310^{14} only when irradiated with 26MeV protons: agreement with Karlsruhe test beam work.

10. V O'Shea: Review of James Watt NanoFab' facilities at Univ. Glasgow. (750m^2 clean rooms, e-beam writer etc.). Examples of high resolution work (3nm on 1mm squares with stitching). GaN, 3D etched structures in Si and GaAs. Provision of facilities and expertise for diamond processing, initial work done with ESRF on single crystal material.

11. G Verona: Single crystal CVD growth, standard lithography and detector device characterization. Immediate access to Frascati EURATOM/ENEA neutron irradiation facility (moderated thermal up to 14.8MeV D-T reaction). Films grown 20~220μm intrinsic and B doped. Complete CCE and 0.4~1.5% alpha spectrum resolution, no priming nor polarization effects , stable devices at JET operation since 2 years. Al Schottky contact on intrinsic on B-doped homoepitaxial grown devices with peripheral silver contact. Neutron detection by ^{6}LiF contact overlayer, radiation hard to >2x10^{14} n/cm^2.

11. R Lovrincic: Characterizing single crystal diamond surfaces with AFM, metal contact film growth with in-situ LEED and IR spectrometry. Will look at carbide formation process with Cr electrodes using UV spectroscopy at synchrotron (BessyII?) beamline.

12. M Nesladek: Growth of single crystal diamond at Saclay (with N Tranchant). As grown surfaces varying from step (~μm size) flow to atomically flat by process parameter variation, but flat surfaces have poor charge transport, believed due to excess vacancy defects. FTPS optical absorption spectroscopy to characterize mobilities etc. Proposed work at Saclay is optimization of growth; treatment/smooth surfaces for metal contacts; Schottky diodes and lithography; defect spectroscopy and kinematics; growth and radiation hardness studies of B and P doped material. Coworkers at Univ. Prague: linear antenna CVD growth of nanocrystalline, 'electronic grade' δι αμονδ (20~100νμ γραιν σιζε, 20~400νμ (μm?) thickness, claimed μτ values 10^{-8} ~10^{-6}.

13. J Morse: Characterization methods for diamond bulk and surfaces at ESRF (AFM, SEM-EBIC, interferometry and synchrotron beamline imaging topography). Existing in house program for characterization of perfect, HPHT grown plates for X-ray optics. Mapping of devices by X-ray microbeam scanning. Interest is single crystal diamond for beam monitoring. Thermal power (10~100W) mounting techniques.

(EBe) Financial Issues:

Discussions about the treatment of Overhead in FP6/FP7 and especially for the new case of the previous AC Institutions; as far as it remains non clarified from Carlo: 20% on the personnel request is assumed for all contractors in CARAD.

Differences also in the Understanding of the Overheads:
On a first view, it seems that nothing is changed (except different notification), because
the new arithmetics in FP7: EC Request = 75% of (100% Proj + 60% Ovh) = 120%
gives the same number as in FP6: EC Request = 100% of (100% Proj) + 20% Ovh = 120%.

However, there is a substantial reduction (25%) of funds going in real support of the JRA's work, for institutions with 60% Overhead. The CARAD coordination has the duty to keep the support for the projects R&D and not for the infrastructure of the corresponding Institution receiving the funds. Consequently, I'll try to avoid EC request for personnel for such institutions.

The sum of the todays request is 2.8MEU (MSU, VERA etc . not included), i.e.: about 3MEU.

This is a number out of discussion, which must be divided by at least a factor of 2
in order to have a chance for success!

Furthermore: We should squeeze and cut not only budgets but also R&D issues,
in order to create a well managed project of a clear structure, which is presently not the case.

EBe will send information about the FP6 *HadronPhysics* proposal as soon as possible,
including the todays talks, and – a new proposal of a realistic Budget Distribution.