Statement for the Election of CMS Spokesperson: Paris Sphicas

By all measures, CMS is one of the most successful scientific endeavors of all times. After a long twenty years from conceptual design to installation and commissioning, we were truly ready to do physics, and have been doing great physics, starting with the earliest pp collisions and heavy-ion runs. And while the discovery of a Higgs boson at 125 GeV has been registered in the Annals of Physics in gold letters, there is much more. CMS has been producing one of the richest crops of physics results in history, including many important "firsts".

We owe this success to (a) a very talented, dedicated and motivated collaboration from all parts of the world; (b) a superb integrated detector, trigger and data acquisition system, along with correspondingly intelligent software and computing systems and performant analysis code; and (c) organizational structures and management, that have enabled the running of a complex global undertaking of an unprecedented magnitude. As with any project of this scale, the road to here was not entirely smooth. We have encountered obstacles, and time and again our collaboration has risen to the challenge and has emerged wiser, more effective, and stronger overall.

Yet, as is well known, while reaching the top is hard and requires a lot of focus and dedication, remaining at the top is even harder. We now face multiple open fronts; preparations for 2016 data-taking, ongoing 13 TeV analyses, Phase I improvements to handle harsher beam conditions and detector aging, and preparing for our long-term future. Carrying out all these in parallel, often with fewer people and less financial resources than in the past, is a major challenge.

I believe that, in general, our structures and system of work have served us very well and we do not need major changes. Some targeted, carefully planned changes could, however, improve both our efficiency and quality of life within the experiment. Any such change must be gradual and applied with caution, planned with the broad involvement of the collaboration, and based upon a deep understanding of how things have evolved in CMS, alongside an appreciation for the new realities of the past few years. I am convinced that we have the talent, experience and strong motivation to meet the current challenges and any new challenges that will come our way.

Technical Coordination and planning ahead for Run II and well beyond

The Cold Box contamination has been very trying for all of us. It made it very difficult to operate the experiment, and it put much stress on our Technical Coordination (TC) team. The coordinated efforts of our TC team, the CERN cryo group and Technical Department, and advice from outside experts, who responded to the call for help from our TC, have allowed us to collect ¾ of the luminosity delivered by the LHC with the magnet on. Furthermore, the "risk analysis panel", consisting of experts with vast experience in large complex systems, from both inside and outside CMS, has concluded that the plan we are currently following will restore normal operation. What the management should do (and this is already happening) is to provide the teams that will carry out this plan with all the support and resources they need.

Looking ahead, we should strengthen our TC team in advance of the requirements of the long shutdowns and the Phase II upgrade. As we move towards the TDRs, more and more TC issues will come to the surface: providing the required assembly & testing facilities at CERN and the upgraded common systems, planning the new services, from cooling to cabling to support systems, integration with new elements (e.g. detectors around the new beam vacuum chambers). All this will require a tremendous amount of work – in parallel with "current" CMS and the duty of post-TDR oversight of upgrades. CMS management has to work with CERN management to find the required resources to deliver all this, a process that is already ongoing for over a year now. I will seek collaboration advice to form a panel to review all the work that lies ahead, and in collaboration with our Technical Coordinator, propose the organization adapted for the future.

The three main fronts

With the operation of the magnet returning to normal, we will be facing three fronts:

1. *Run II – and its physics.* Our clear, top priority for the next three years should be the physics that's knocking on our door. Run II, with its 13 TeV and the promise for 100 fb^{-1}, is more than an incredible, once-in-a-lifetime opportunity: it is also our duty to continue to produce the results that will help guide the field of HEP and its future.
2. *Phase I Upgrade.* This upgrade is essential for us to stay at the top: we need the trigger, HCAL and pixels upgrades to maintain our excellent performance in Run II as the instantaneous luminosity and pileup increases.
3. *Phase II Upgrade.* With the approval of our upgrade by CERN and the RRB, we have to rise to the challenge of producing Technical Design Reports, while maintaining tight control over costs and optimizing performance. We also have to define our sharing of all of the tasks in the upgrade.

Run II and its physics. The future of the entire field of HEP is crucially dependent on what we will find in Run II – all eyes are upon us. The "structure" in the diphoton spectrum at 750 GeV, even if it turns out to be just a statistical fluctuation, has reminded everyone that we are a discovery experiment. There are by now more than 100 preprints, utilizing everything from gravitons and dark matter to composite and extended scalar sectors, to "explain" the structure. We must remain on high alert, and be prepared to address the possibility that this will turn out to be a major discovery. We must study and analyze our data swiftly and efficiently; keep the full collaboration involved and informed; and plan for a major discovery, for it may be just around the corner. *And this applies to the full spectrum of physics*.

In addition to the scientific stakes being so high, in the next three years we will face a continuous stream of changes in the machine conditions and in our detector, as we install elements of the Phase I upgrade and as its response changes with time. More importantly, we will be facing changes at the heart of CMS, namely the turnover of the people who keep CMS running, collecting, storing and reconstructing the data, carrying out calibrations and alignment, and making it all available to the rest of CMS. All this will require the collaboration to continue to contribute to the areas of Run Coordination, Operations (also at P5) and DPG, POG-PPD-Software-Trigger, as much as in the past, if not more so. *The key to our success in Run II will be the building of a pipeline of young experts who will devote their energy to these areas that really determine our physics output*. These areas are not only the true "enablers" of CMS Physics: they constitute the best training ground for the new generation of physicists of CMS. Our reliance on a few individuals who end up spending an enormous amount of time on these extremely valuable tasks, and then get stuck with these tasks for a very long time, must be discontinued.

We have to plan ahead, with the institutes in CMS, for a full pipeline of new contributors who will seize the opportunity to work hard on what constitutes the core of our physics-producing activity; and in turn, they will get recognition and credit, and will then be able to move on to positions of higher responsibility. Key to this will be finite terms that are long enough to be meaningful, yet short enough to enable people to move on. The volunteers would be reassured that this is not an open-ended, thankless assignment, but a necessary, very valuable contribution to CMS, one that opens up the next layer of the experiment to them. I will work with CMS institutes and clusters of institutes in a continuous process of identifying the next set of people months ahead of time. This will enable the institutes to plan for these tasks as institutional responsibilities.

As for our overall organization, I see the need for some evolution in two areas: (i) A more frequent synchronization between the areas of Computing-Software-Trigger-PPD-Physics, e.g. via a meeting every 5-6 weeks, is needed. We currently rely on CMS and Physics weeks, and management meetings, for this synchronization. The dissemination of the planning to all concerned, and the reasons for decisions, e.g. timing of releases, planning for evolutions in the Trigger, production requests, should take place in a more timely and clear way; (ii) The Computing Resources Board (CRB) also needs to be strengthened, and its connections to the major stakeholders need to be re-established. In addition, our computing and analysis model should be re-evaluated to take into account the new realities introduced by our new data management elements (e.g. the data federation and the miniAOD) as well as the current computer centers. The process has commenced in 2015 and we should complete it in time for the core of Run II.

Phase I Upgrade. Despite the word "upgrade", this is an absolutely essential part of "current CMS", necessary to maintain our performance throughout Run II and beyond. We must do our absolute best to proceed with the HCAL and pixels installation in the 2016 YETS. Management should work very closely with these projects and communities to carefully plan all the steps that need to be carried out in 2016, and then help to ensure this goal.

Phase II Upgrade. Creating the full "Money Matrix" for the Phase II upgrade will require several rounds of discussions with the countries, regions and individual institutes of CMS, to match scientific interests to financial realities and to the needs of the experiment. This needs understanding and appreciation of both the "major" and the "smaller" stakeholders: the process must enable all to contribute in the best possible way, respecting existing expertise and strengths, alongside wishes for the future. *The key to a successful Upgrade will be the building of a sizeable community of young physicists who will be experts in developing/constructing/operating the novel detectors for the future of CMS.* Finally, we must also continue the R&D, some of which is time-critical, and proceed to TDRs, which will be submitted during the next SP term. We are reinstating the Comprehensive Reviews and projects are defining milestones to allow tracking and timely intervention when needed. For those of us who were there from the beginning of the construction era, this brings back fond memories. And this time we are wiser, searching for synergies, e.g. in electronics, at the earliest phases.

Role of the spokesperson

We are a collaboration of volunteers, who are driven by the physics and our desire to see our groups and ourselves make pivotal and lasting contributions to CMS. In my mind, the spokesperson (SP) of such a large collaboration of 160+ institutions and 3000+ members has four dimensions:

(a) **The SP is the principal face of the Collaboration to the world outside CMS**, both in particle physics and wider afield. The SP has to represent the collaboration in several settings: CERN management; SPC; RRB; LHCC; some major conferences; also to >40 countries and funding agencies, understanding the very wide range of systems and needs. **The SP has to present and defend our physics and our plans to all these bodies.**

(b) **The SP has to lead the collaboration**. This translates into a play with four acts: consulting, planning, informing and finally acting. Often a number of iterations are necessary. This is the only way that a large collaboration of volunteer scientists, from independent funding agencies, can be motivated to follow a common goal.

(c) **The SP has to coordinate and manage the experiment**. This translates into always looking ahead, and planning, planning and planning, ahead of any "surprises". Clearly, some surprises are unavoidable, so one must have in place an agile and experienced management team that consults fast and reacts promptly, utilizing the full might of CMS.

(d) **The SP has to lead the way towards making CMS a "rewarding and enjoyable experiment to work on"**. On a practical level, I plan to engage all of CMS by holding regular meetings with regions and clusters of institutes in CMS every 4-6 months. The idea would be to learn of any developments and new issues that may need help from CMS at large, as well as to capitalize on the talent and potential opportunities throughout the Collaboration.

A personal note

I have a 30-year presence in hadron collider experiments (UA1, CDF, CMS). I joined CMS in Feb 1994, initially on the DAQ project as responsible for the event-builder/HLT R&D, moving to manager of the Physics Reconstruction and Selection project, and then to project manager of Computing/Software/PRS/HLT-Trigger. Later, as the physics coordinator, I led our physics preparations for the first LHC beams, also putting in place much of the organization and CMS-wide entities that we currently have. I have also served as chairperson of the publications committee (and as an example of distributing and delegating work, I split it into a number of PubComm boards; the system has been shown to work). For the past two years, as deputy SP, I have tried to help the SP as much as possible. In summary, the bulk of my scientific career is inextricably linked with CMS, and I remain to this day full of enthusiasm and energy for this great experiment.

As a university professor for over 26 years, both in the US and in Greece, and as a senior physicist at CERN for 18 years, I have a wide perspective and understanding of the international dimension of CMS, as well as a deep appreciation of life both at a research center and at a university. I understand the boundary conditions of both, just as I know the strengths and limitations – of both. I also believe that I have a deep understanding of CMS and of the CERN environment, as well as the knowledge, experience and skills to bring in change when needed, while maintaining continuity. Foremost, I am known to think ahead, keeping an eye on forming the right strategy, both for the short and for the long term.

In brief, I believe I have accumulated the relevant experience, both in terms of breadth and in terms of depth, to act as the SP of CMS. If I am honored by being elected, I will serve the office of SP to the absolute best of my abilities.