In this work we performed Geant4/GRAS calculations for the eva- luation of dose reduction to astronauts, in case of exposure to a SPE, using different models of a radiation protection spacesuit.A successful outcome of the test on board the ISS, together with dedicated simula- tions and measurements of the spacesuit radiation shielding perfor- mances for different SPE environments, will provide important progress in the field, leading to the further refininement of the design of radia- tion protection spacesuits and their possible adoption in future long- duration manned missions in deep space.Suit elements have a thickness in the range 2–6 cm and the total mass for the garment sums up to 35–43 kg. Dose reduc- tions have been converted in time gain, e.g. the increase of time delay between the occurrence of a SPE and the time the dose limit to BFO to prevent the onset of symptoms of radiation sickness is reached: for the best performing suit the gain is more than 100% in the IVA scenario, meaning that the astronaut has more than double of the time (e.g. 5.9 instead of 2.5 h) to perform emergency operations outside a radiation shelter in case of a SPE when wearing the suit.The results of the 1D simulation phase can be summarized as fol- lows: (i) for a fixed volume, materials with high density (Aluminum and Nextel 312) provide more shielding but they have a higher mass (2 The mathematical phantom of GRAS has then been exposed to the chosen SPE radiation environment, both in the scenario of EVA (phantom in free space) and IVA (phantom inside a typical aluminum module).After dedi- cated 1D simulations to evaluate the ranking of different materials in terms of shielding properties, combinations of best performing mate- rials have been adopted in the design of spacesuit models.Concerning the possible use for EVA, realistic elements of current spacesuits (such as oxygen supply and propulsion systems) should be added in the calculations to draw any conclusion, but the proposed shielding strategy can possibly be implemented or applied also to existing EVA spacesuit models.It is important to note that presented results are not to be intended as generally valid, as they depend on several factors: the choice of the specific model for the SPE environment; the choice of the phantom and the definition of BFO; the Al thickness chosen to represent a typical space module for IVA activities.For the two scenarios, dose values to BFO in Gy-Eq were de- rived for the phantom with/without the proposed spacesuit models, whose design was based on a selective shielding strategy.